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STATE MINERAL SUMMARIES 1991

U. S. DEPARTMENT OF THE INTERIOR

BUREAU OF MINES

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INTRODUCTION

The STATE MINERAL SUMMARIES publication provides estimated data and summaries of mineral activities at the State level for 1990. Most of the estimates are based on nine months data. These summaries have been prepared in cooperation with State geological surveys or related agencies. Individual State summaries are published separately as State Mineral Industry Surveys and copies can be obtained from the appropriate State Activities field office.

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* Including Northern Marianas, Island Possessions, and Trust Territory

STATE RANKING AND PERCENT OF U.S. TOTAL
1990 (Estimated data)

State	Value (thousands)	Rank 1/	Percent of U.S. total
Alabama	$561,627	21	1.68
Alaska	641,399	18	1.92
Arizona	3,060,218	1	9.15
Arkansas	414,687	26	1.24
California	2,722,343	2	8.14
Colorado	405,315	27	1.21
Connecticut	108,277	42	.32
Delaware2/	7,901	50	.02
Florida	1,529,759	5	4.58
Georgia	1,477,422	7	4.42
Hawaii2/	103,144	44	.31
Idaho	344,185	31	1.03
Illinois	661,351	17	1.98
Indiana	459,281	25	1.37
Iowa	318,725	34	.95
Kansas	366,486	29	1.10
Kentucky	333,979	32	1.00
Louisiana	381,105	28	1.14
Maine	56,043	46	.17
Maryland	353,834	30	1.06
Massachusetts	111,311	41	.33
Michigan	1,366,427	8	4.09
Minnesota	1,507,029	6	4.51
Mississippi	122,104	40	.37
Missouri	1,110,302	10	3.32
Montana	573,781	20	1.72
Nebraska	106,390	43	.32
Nevada	2,625,554	3	7.85
New Hampshire2/	37,380	47	.11
New Jersey	235,345	36	.70
New Mexico	1,078,038	12	3.22
New York	737,013	14	2.20
North Carolina	578,361	19	1.73
North Dakota2/	20,449	48	.06
Ohio	722,620	15	2.16
Oklahoma	237,201	35	.71
Oregon	220,609	37	.66
Pennsylvania	1,083,156	11	3.24
Rhode Island2/	12,402	49	.04
South Carolina	483,648	23	1.45
South Dakota	321,564	33	.96
Tennessee	679,240	16	2.03
Texas	1,555,665	4	4.65
Utah	1,234,669	9	3.69
Vermont	93,181	45	.28
Virginia	512,091	22	1.53
Washington	473,381	24	1.42
West Virginia	132,008	39	.39
Wisconsin2/	209,552	38	.63
Wyoming	934,338	13	2.79
Undistributed	9,849	--	.03
Total3/	33,432,000		100.00

1/Ranking based on unconcealed state values.

2/Partial total, excludes values that must be concealed to avoid disclosing company proprietary data. Concealed values included with "Undistributed" figure.

3/Data may not add to totals shown because of independent rounding.

ALABAMA

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Annual, Estimated

THE MINERAL INDUSTRY OF ALABAMA IN 1990

The U.S. Bureau of Mines estimated the value of Alabama's nonfuel mineral production in 1990 at $562 million, approximately $99 million over the value reported in 1989. The estimated 1990 value was a new State record and the first time that mineral sales exceeded the half-billion dollar level. Increased demand and output for portland cement, construction sand and gravel, and crushed stone accounted for the new record. The estimated value of these three construction mineral commodities was 28% higher in 1990 than in 1989. Alabama continued to rank 21st nationally in mineral value.

In the industrial minerals sector, Monarch Tile Manufacturing Inc., the Nation's fourth largest ceramic tile manufacturer, moved its corporate headquarters from San Angelo, Texas, to Florence, Alabama. The Atlanta-based Georgia Marble Co. and Swiss-based Pluess-Staufer announced formation of a joint venture, Alabama Carbonates L. P. The new company will produce calcium carbonate pigments. Cheney Lime and Cement Co. began work on a rotary calcining kiln at its Alabaster facility. Occidental Chemical Corp. announced a $15-million expansion to install state-of-the-art membrane cells for chlorine and caustic soda production at its Mobile plant.

In the metals sector, Reynolds Metals Co., Listerhill, broke ground for a $125-million aluminum casting facility in Colbert County. In March, the company announced an additional $125-million expansion to the Listerhill facility.

In the fuels sector, Alabama coal mines produced 28 million tons of coal. Underground mines produced 57% of the total. According to The Coalbed Methane Association of Alabama, approximately 30% of the natural gas produced in the State in 1989 was extracted from coal seams.

Employment. In 1989, the latest year for which data are available, the State's annual average mining employment, including coal, was 47,000. Mining employment varied from an August high of 47,500 to a January low of 46,340. The average annual coal mining employment was 11,300.

Environment. A major controversy, one that could affect many of Alabama's mineral producers, developed over Georgia's request for water allocations from Georgia lakes draining into Alabama's river systems. Water from these rivers affects 47 of Alabama's 67 counties. The State filed suit against the U.S. Army Corps of Engineers to prevent the allocation. Florida later joined with Alabama in the suit.

Table 1.--Nonfuel mineral production in Alabama 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry -------- thousand short tons --	273	$16,457	252	$13,852	270	$15,000
Portland ------------------------ do. --	3,524	157,214	3,169	130,590	3,900	163,800
Clays2/ ------------------ metric tons --	2,282,670	16,039	1,878,070	18,537	1,986,184	20,679
Gem stones ------------------------------	NA	5	NA	W	NA	W
Lime ------------ thousand short tons --	1,450	66,576	1,481	70,361	1,578	75,744
Sand and gravel:						
Construction ---------------------- do. --	11,742	41,417	e/10,400	e/36,500	16,500	60,900
Industrial ------------------------ do. --	871	8,507	805	8,092	850	8,680
Stone (crushed) ------------------- do. --	e/29,700	e/140,100	3/31,737	3/167,332	3/36,200	3/202,400
Combined value of bauxite, clays (bentonite), salt, stone [crushed granite (1989-90), dimension], talc and pyrophyllite, zircon concentrates (1988), and values indicated by symbol W ------------------------------	XX	13,180	XX	r/17,358	XX	14,424
Total----------------------------------	XX	459,495	XX	462,622	XX	561,627

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data, value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" data.
3/Excludes certain stones; kind and value included with "Combined value" data.

In other environmental news, the Federal Environmental Protection Agency reported that two Birmingham-area coke plants were among the State's major air polluters. Interstate Lead Co., Birmingham, was fined for violating Alabama's water pollution standards. The company's general manager noted that the firm had spent millions of dollars installing a state-of-the-art water treatment system, and the fine resulted from a misunderstanding between the company and State.

Legislation and Government Programs. A bill creating a Spill Response Task Force was signed into law following the 1990 legislative session (Act 90-741). The Task Force duties are to evaluate Alabama's readiness to respond to oil and hazardous materials spills in the State coastal waters.

In April, the University of Alabama, Tuscaloosa, dedicated the $17 million Energy, Mineral, and Material Science Research Building. The 140,000-square- foot facility was designed solely for research and houses the Departments of Geology, Mineral Engineering, and the Mineral Resources Institute. The building was funded by the U. S. Department of Energy, the University of Alabama, and a State bond issue.

The University was named as one of four regional casting research facilities. The University has a metal casting technology program, and Alabama foundries employ about 18,000 people and produce $1 billion in castings annually.

Auburn University, which was named the National Center for Asphalt Research in 1986, continued studies on quality control and quality assurance for contractors, latex modified asphalts, the causes and cures of highway rutting problems, and the use of limestone in surface mixes. Auburn's Space Power Institute and Micro-electronics Science and Technology Center continued studies on synthetic diamond production for space and earth technology utilization.

Review by Nonfuel Mineral Commodities. The top five leading nonfuel mineral commodities produced in Alabama, in terms of value, were **crushed stone** (36%), **portland cement** (29%), **lime** (19%), **construction sand and gravel** (11%), and **clays** (4%). Four of the five are basic raw materials for the construction industry.

Monarch Tile Manufacturing Inc., the Nation's fourth largest manufacturer of ceramic tile, moved its headquarters from Texas to Florence. The company operated two plants in Florence and one in Marshall, Texas. Monarch produced ceramic wall and light-duty floor tile. **Ball clay** for tile manufacture was shipped to the Florence plants from Tennessee.

A **calcium carbonate** slurry pigment plant was announced for the Sylacauga area where the Georgia Marble Company controls extensive reserves of white marble. The plant, a joint venture with Pluess-Staufer, will produce filler and coating grade pigment for the paper industry.

Occidental Chemical Corp. announced a $15 million expansion to be completed at the company's Mobile plant in 1991. The modernization and expansion will replace mercury cells with membrane cells for **chlorine** and **caustic soda** manufacture.

Air Products and Chemicals Inc., Decatur, will build a new $20 million plant to increase its output of oxygen, nitrogen, and argon. A gaseous nitrogen pipeline will be built to service nearby chemical plants.

On the metals scene, Reynolds Metals Co., Listerhill, broke ground for a $125-million **aluminum** casting facility. The expansion is part of a number of projects at the northwest Alabama complex, with a total value approaching $400 million. The projects, when completed, will make the Listerhill aluminum complex a world-class competitor in the aluminum can stock business.

The Defense Logistics Agency awarded a contract to O'Dell Construction Corp., Prattville, for **tantalum** concentrate for the National Defense Stockpile. O'Dell is the only company mining tantalum ore in the United States.

ALASKA

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Annual Estimated

THE MINERAL INDUSTRY OF ALASKA IN 1990

The Bureau of Mines estimated the value of Alaska's nonfuel mineral production in 1990 was $631.4 million, three times the final value of $213.4 million reported in 1989. Most of this gain was due to the output of lead, silver and zinc by the Greens Creek Mine and the Red Dog Mine. Alaska ranked 18th among the States in the production of nonfuel minerals, up from 34th in 1989 and 40th in 1988. The chief metals produced, by decreasing value and by rank among the States, were zinc (1st), gold (7th), lead (2nd) and silver (3rd). The estimated gold production was 8,145 kilograms (261,867 troy ounces), an increase of over 40% from the final quantity reported to the Bureau of Mines in 1989. In late November the State estimated 1990 gold production would be about 210,000 troy ounces. The amounts and values of lead, silver and zinc were withheld to avoid disclosing company proprietary data. Construction sand and gravel production was about 15 million short tons, 12% below the estimated production in 1989. Crushed and broken stone production was estimated to be 2.7 million short tons, about 7% below production last year. Alaska also produced tin, jade, portland cement and soapstone.

Table 1 --Nonfuel mineral production in Alaska 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$50	NA	W	NA	W
Gold2/ kilograms	4,210	59,320	5,756	$70,800	8,145	$99,510
Sand and gravel (construction) thousand short tons	17,200	48,749	e/17,000	e/48,500	15,000	44,800
Silver2/ metric tons	1	135	W	W	W	W
Stone (crushed) - thousand short tons	e/1,800	e/8,400	2,900	20,300	2,700	19,800
Combined value of cement (portland), lead (1989-90), tin (1988-89), zinc (1988-90), and values indicated by symbol W	XX	2,040	XX	73,752	XX	477,289
Total	XX	118,694	XX	213,352	XX	641,399

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Recoverable content of ores, etc.

Exploration expenditures were estimated to be about $60 million. Most of the exploration effort was on gold deposits. The total number of active mining claims was 56,979 in November 1990, down 13.5% from the 65,875 claims active in November 1989, according to State survey figures. In June 1990, about 6000 claims were abandoned on State land when the first payments were due under the State's new mineral leasing law.

Employment. Nonfuel mining employment was about 4600 according to a preliminary State estimate, about the same as in 1989. Most of the exploration, placer mining, sand and gravel, and stone production jobs were seasonal. The increasing number of all-year hard-rock mining operations has raised the number of year-long jobs.

Exploration. The Alaska Division of Geological and Geophysical Surveys estimated exploration expenditures were about $60 million in 1990, 20% over the amount spent in 1989. A large part of this money was spent in southeastern Alaska on gold and precious-metal-base-metal properties.

Diamond drilling, underground work, and environmental and engineering activities brought the Alaska Juneau and the Kensington gold mines to the final feasibility, environmental impact study and permitting stages. The proposed operations will have daily production capacities of 22,500 and 4,000 short tons, respectively. Echo Bay Exploration Co. reported its Alaska Juneau deposit contained more that 100 million short tons averaging 0.05 troy ounces of gold per short ton. Echo Bay also diamond drilled a long hole and some offset holes beneath Gastineau Channel that intersected the Treadwell deposit well below the old flooded mine workings. The Echo Bay-Coeur d'Alene Mines Co. joint venture delineated about 8.4 million short tons of ore averaging about 0.154 troy ounces of gold per short ton at the Kensington Mine. The Greens Creek Mine did extensive diamond drilling and geological work to further evaluate the extensions and reserves of its underground gold-silver-lead-zinc deposits. Placer Dome U.S. Inc. continued drilling and evaluating the old Jualin gold mine and making other investigations statewide; it also established an exploration office in Anchorage.

American Copper Nickel Co. drilled and explored a gold-copper-bismuth deposit in a dolomitized breccia north of Dolomi on Prince of Wales Island with apparently favorable results. This deposit was recently discovered and is owned by Sealaska Corp., the Native corporation for southeastern Alaska. Lac Minerals (USA) Inc. did the work necessary to hold its Lookout copper-zinc-gold group and Ruby Tuesday lead-zinc claims on Prince of Wales Island. Several other companies and various individuals also did exploration work in the Juneau, Ketchikan and Hyder districts. Fairbanks Gold Limited spent about $12 million on exploration and bulk sampling at the Fort Knox gold deposit northeast of Fairbanks, according to the State survey. Drilling results are reported to indicate a reserve of over 5 million ounces of gold in an intrusive-hosted deposit averaging about 0.038 troy ounces of gold per short ton. The property was offered for sale to a company capable of bringing the deposit into production. Fairbanks Gold also continued exploration of a large low grade gold deposit near Flat, Alaska.

Central Alaska Gold Co. continued exploration of the Nixon Fork gold-copper deposits northeast of McGrath. It has brought the Mystery sulfide deposits and the Crystal-Garnet oxidized deposits to the feasibility stage and had started a fast-track permitting effort. The Nixon Fork Project is a joint venture of Battle Mountain Exploration Company and Central Alaska Gold Co., the operator. The company reported it was planning on production in the 150 to 300 short tons per day range by mid-1992. The old mine produced high grade gold ore between 1920 and 1932. American Copper Nickel Co. continued exploration at the Grant gold mine, west of Fairbanks. The company reported exploration results in the third year indicated its Ptarmigan Hill gold prospect in the Seventy mile River area was considered uneconomic. Tenneco Minerals Co. has replaced Placer Dome as operator at the Dry Creek gold lode prospect inland from Nome. An earlier news release said current exploration credited the deposit with over 11 million short tons averaging 0.07 troy ounces of gold per short ton. There was also active exploration at the Mount Distin lode gold prospect about 20 miles north of Nome. There were many companies involved in other exploration projects in Alaska.

Environment. Many placer mines are still having trouble meeting State turbidity regulations. Complete recycling of process water is the main savior for turbidity problems. Enactment of a mined lands reclamation law by the State legislature is a step toward environmental protection but is considered inadequate by some conservation organizations. The Federal no-net-loss wetlands policy will make development of land-based resources difficult in most areas in Alaska because most of the land with a reasonable gradient is either muskeg or permafrost land. There is a lack of land that can be converted to wetlands on a no-net-loss basis to replace wetlands lost to mineral and other types of development. Although technically wetland, most of the areas so classified in Alaska do not have the productive potential and environmental values of similar-appearing land situated in milder climates. Alaska has about 170 million acres of wetlands. Cancellation of the draft National Pollution Discharge Elimination System permit issued for the disposal of Quartz Hill molybdenum mill tailings in Smeaton Bay and the prohibition of future marine disposal of mill tailings by the Environmental Protection Agency are causing other environmental problems related to tailings disposal for developing large-scale mines. The city of Skagway has been the marine shipping port for gold, copper, silver-lead and lead-zinc ores and concentrates during the last 90 years. Ores and concentrates were hauled by railroad and later by truck the length of the town to the port storage areas and then loaded on outbound ships. Fugitive dusts containing mainly the lead and zinc sulfides galena and sphalerite have contaminated residential and business areas along the railroad and highway. Extensive sampling and cleanup procedures have been implemented to alleviate the environmental concerns. The only residents having slightly elevated blood lead levels were five workers at the concentrate handling facility that were known tobacco smokers.

Legislation and Government Programs. A bill initially opposed by the mining industry was passed by the State Legislature after revision by a conference group of mining and conservationist interests. The law requires reclamation of State, Federal, municipal, and private land and water for all mining operations disturbing over 5 acres or 50,000 cubic yards per year. In addition, performance bonds not to exceed $750 per acre are required for each mining operation. A statewide bonding pool will be established to alleviate the proven difficulty of obtaining individual bonds. Draft regulations have been prepared for presentation to the legislature by mid-January 1991 and final adoption by mid-October 1991. Regulations have been published for the court-mandated change in the mining law for State lands to a rents and royalties system. Annual rents are now $20 on each mining claim and $0.50 per acre on each mining lease. Operating mines will pay a 3% net royalty in addition to the current mining license tax. A court decision has held up permitting, delivery of titles, and other actions on State lands that were designated for the use of a Mental Health Trust. This decision had serious effects on some current coal mine, sand and gravel, and other projects. An addition of 296,000 acres of Wilderness and some other provisions in the Tongass Timber Reform Act withdrew land from mineral entry and provided other obstacles to mineral development in southeastern Alaska. The scheduled revision of the Tongass Land Management Plan by the U.S. Forest Service recognized the importance of minerals, a natural resource, by providing a minerals prescription covering each of 52 recognized mineralized areas, but the plan also recommends some additional withdrawals of land from mineral entry.

Review by Nonfuel Mineral Commodities. **Zinc** was the most valuable mineral commodity produced in Alaska in 1990, accounting for over half of the value of nonfuel mineral production. Alaska ranked first among the states in zinc production. The Greens Creek Mine near Juneau and the Red Dog Mine north of Kotzebue produced the zinc as sulfide flotation concentrates. The Greens Creek underground mine milled about 400,000 short tons of ore during 1990, its first full year of production. A published article lists the average grade of ore reserves at 9.7% zinc, 3.9% lead, 24 troy ounces silver per short ton, and 0.18 troy ounces gold per short ton. Greens Creek was the top silver producer in the United States in 1990. The Red Dog open pit mine started commercial production soon after the first of the year and will be gradually brought up to its rated capacity of 6000 short tons per day by the end of 1992. Announced ore reserves average 17.1% zinc, 5% lead and 2.4 troy ounces silver per ton.

Gold was the second commodity in value in 1990. The Bureau of Mines estimate was about 261.9 thousand troy ounces, well above a preliminary estimate by the State of about 210 thousand ounces. Greens Creek was said to be the top gold producer in the State in 1990, the standing held for several years

by the Denali open pit placer mine of Valdez Creek Mining Co. The Denali Mine where operations ceased in October 1989, reactivated in October preparatory to resuming production in 1991. The offshore gold placer operation of Western Gold Exploration and Mining Co. Ltd. Partnership was scheduled for closure in November. It was terminated in September because of a mechanical breakdown, storms and other problems. WestGold's gold exploration projects and offices in Alaska were all closed. Alaska Gold Co. continued to operate two productive bucketline dredges near Nome. About 200 mechanized placer mines of various sizes also produced gold. The Ryan lode open pit heap leach mine west of Fairbanks continued to recover gold by circulating solutions on existing pads. There was no mining in 1990 by the operator, Citigold Alaska Inc., because of permitting problems with land and environmental agencies. About one half of the 1990 gold was produced by two small lode mines and about 200 mechanized placer mines of various sizes.

Production of **lead** by the Greens Creek and Red Dog Mines brought Alaska's rank up to second among the lead-producing states; in 1988 there was no lead production reported. Alaska ranked third in production of **silver**. The metal was contained in zinc, lead, and bulk concentrates from the Greens Creek and Red Dog mines and as a coproduct with placer and lode gold. **Construction sand and gravel**, at about 15 million short tons, was about 12% below the 1989 amount. Reduced development in the North Slope oil fields and low rates of public and private construction cut the demand for construction sand and gravel but demand for **crushed and broken stone** remained about the same as for 1989 at 2.7 million short tons. Small amounts of **portland cement** and **gemstone** production were reported. Gemstones usually consist of jade and carving-quality soapstone. The State reported **tin** production by Shorcham Resources was contained in about 32 tons of coproduct cassiterite concentrates recovered at its gold placer mine on Cache Creek, in the Tofty area.

ARIZONA

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Annual, Estimated

THE MINERAL INDUSTRY OF ARIZONA IN 1990

For the third consecutive year, Arizona led the Nation in the production of nonfuel minerals. Estimated figures prepared by the U.S. Bureau of Mines indicate the value of nonfuel minerals output in the State was about $3.1 billion in 1990. This amount reflected a decline from the previous year of about 4% and was the first drop in value since 1984. Arizona, however, still accounted for more than 9% of the national value of nonfuel minerals.

The output of metallic minerals was valued at $2.8 billion. Approximately 93% of the mineral production value in the State was attributed to the output of copper, gold, molybdenum, and silver. In addition, Arizona was among the leading states in the production of the industrial minerals: bentonite, cement, gem stones, lime, and construction sand and gravel.

Table 1 --Nonfuel mineral production in Arizona 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	148,392	$1,980	188,211	$2,506	193,743	$1,930
Copper2/ ---------- do. --	842,728	2,238,875	898,315	2,593,292	963,189	2,633,098
Diatomite ---------- do. --	7,257	1,208	W	W	W	W
Gem stones ----------	NA	3,300	NA	2,821	NA	2,821
Gold2/ ---------- kilograms --	4,549	64,106	2,810	34,564	2,759	33,708
Lime ---------- do. --	674	29,637	W	W	W	W
Iron oxide pigments (crude) metric tons --	--	--	W	W	14	18
Pumice ---------- thousand metric tons --	907	7	--	--	--	--
Sand and gravel:						
Construction ---------- do. --	32,399	123,854	e/33,900	e/133,900	33,100	129,200
Industrial ---------- do. --	119	3,045	W	W	W	W
Silver2/ ---------- metric tons --	152	31,974	171	30,186	131	21,059
Stone:						
Crushed ---------- thousand short tons --	e/7,400	e/33,000	6,649	28,552	3,000	13,500
Dimension ---------- short tons --	W	e/1	W	W	W	W
Combined value of cement, gypsum, iron oxide pigments (crude, 1989), lead (1988-89), molybdenum, perlite, pyrites, salt, tin (1988-89), and values indicated by symbol W ----------	XX	235,596	XX	r/333,474	XX	224,884
Total----------	XX	2,786,193	XX	3,159,295	XX	3,060,218

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Recoverable content of ores, etc.

Employment. Preliminary figures from the Arizona Department of Economic Security (DES) show that the average number of employees in the State's mining industry increased about 5% during 1990 to approximately 12,700 workers. The DES reported that about 9,700 workers were employed in the copper industry.

Environment. At the Sierrita Mine, Cyprus Minerals Co. continued to look for a practical way to eliminate dust blown by high winds from its active mill-tailings pond. Other copper producers have been able to cover inactive tailings areas with crushed rock or soil and vegetation to prevent dust pollution.

Several exploration or development programs in the State were canceled or postponed because of adverse environmental constraints. Bond Gold Corp. planned a drilling program in the Prescott National Forest, but after lengthy regulatory delays and issuance of an exploration permit that it considered too restrictive, the company terminated its interest in the area. Strong local opposition to a proposed exploration program in the vicinity of Portal in the Coronado National Forest forced Newmont Mining Corp. to postpone for at least one year the drilling for gold on its claims.

Late in the year, Phelps Dodge Corp. announced that it had withdrawn its request to trade land with the Forest Service to eventually develop the Copper Basin deposit in Yavapai County. Earlier the company had agreed to pay for an environmental impact study of the proposed mine, but after spending $93,000, decided the projected cost of $2.5 million for the study was unacceptable at this time.

Legislation and Government Programs. The Arizona Desert Wilderness Act of 1990 incorporated about 1.1 million acres of Bureau of Land Management (BLM) land and 1.3 million acres of Fish and Wildlife Service land into the National Wilderness Preservation System. In addition, the legislation retained about 57,800 acres in Cactus Plain (La Paz County) and 4,800 acres in Baker Canyon (Cochise County) as BLM wilderness study areas. The Gila Box (Graham County) received special designation as a riparian national conservation area. With Arizona's San Pedro Riparian National Conservation Area being the first, the Gila Box is the second area in the Nation to receive this management designation.

A large number of bills that addressed environmental issues, particularly in the areas of hazardous waste and air and water pollution, were introduced during the 1990 session of the Arizona legislature. One of the most significant bills that became law was House bill 2007, that established a civil penalty of up to $10,000 per day for each violation of air pollution control laws committed by anyone engaged in metalliferous mining. Attempts to increase severance taxes on minerals were defeated.

During the year, the U.S. Bureau of Mines (USBM) continued to investigate an area in west-central Arizona characterized by gold mineralization associated with extensional detachment faulting. The Bureau also conducted extensive evaluations of known mineral occurrences in the Coconino, Coronado, and Kaibab national forests.

The USBM continued its in situ copper mining research project in cooperation with the Santa Cruz Joint Venture. Hydrologic modeling of the Santa Cruz Test Site, located near Casa Grande, was conducted during 1990 using the Bureau's computer program, MINEFLO.

Review by Nonfuel Mineral Commodities. Arizona mines produced approximately 62% of the Nation's copper in 1990. Output represented a 7% increase over that of 1989. The producer copper price dropped from a 1989 average of $1.31 per pound to $1.23 in 1990. Late in the year, the U.S. Commodity Futures Trading Commission approved two warehouses in Tucson as delivery points for copper under Commodity Exchange (COMEX) contracts. Prior to approval, a COMEX warehouse in Deming, New Mexico was the closest storage location available to Arizona producers.

ASARCO continued to expand and modernize its copper operations in the State. The company announced a $54 million plan to install a solvent extraction-electrowining (SX-EW) plant at the Silver Bell Mine. Earlier plans to expand production at the Ray Mine were modified in 1990 to fund pre-mine

stripping and construct a new tailings pond. An originally planned 18-mile tailings pipeline was eliminated. The total cost of the Ray expansion was reset to $194 million. Late in the year, construction of a new concentrator was suspended because of unexpected permitting delays. In early July, a short strike at the Ray Mine was ended with the ratification of a new labor agreement that provided increased wages and improved insurance and pension benefits.

During the year Cyprus completed a mine and mill expansion project at Bagdad that increased daily mill throughput from 60,000 short tons to 75,000 short tons. The $18 million program should increase total copper production to about 110,000 short tons per year. At its Miami operation, the company announced that the copper smelter will be expanded and modernized at a cost of approximately $93 million.

Magma Copper Co. resumed mining operations at the Magma Mine during 1990. The underground mine, idle since 1982, was reactivated at a production rate of 1,000 short tons of ore per day. The mine and mill were refurbished for about $13 million. Approximately 15,000 short tons of copper contained in concentrates will be shipped annually to San Manuel for smelting. Also during the year, the company began drawing ore from the deep Kalamazoo ore body, which is adjacent to the San Manuel deposit, at a rate of about 6,000 short tons per day. Magma was recognized nationally for its safety record at the underground, in situ leaching operation in Miami. The company received the 1989 Sentinels of Safety award from the cosponsors: Mine Safety and Health Administration and the American Mining Congress.

At Phelps Dodge's Morenci property, enlargement of the SX-EW plant was completed early in the year at a cost of $40 million. The plant capacity, 100,000 short tons of cathode copper per year, is the largest in the Nation. In 1990, the entire Morenci operation was the largest domestic producer of copper in the United States. At yearend, Phelps Dodge announced discovery of a new ore deposit in the Morenci district. Named Coronado, the open-pit mineable deposit has combined sulfide and oxide reserves in excess of 150 million short tons averaging 0.7% copper. The company's Cochise project was continued during the year to evaluate the economic feasibility of mining and leaching low-grade sulfide material located adjacent to the closed Lavender pit.

Arimetco completed construction of a SX-EW plant at the Johnson Camp Mine and began production of cathode copper toward yearend. The plant was designed to produce about 4,800 short tons of copper per year. Total cost to put the property back into operation was about $3.4 million. During the year, the company acquired the Van Dyke property in Gila County. Eventually, Arimetco plans to leach the Van Dyke copper deposit in place and recover the copper in a SX-EW plant.

In 1990, South Atlantic Ventures Ltd. continued developing the underground Oracle Ridge copper mine (Pima County). Milling and concentrating facilities were near completion at yearend. The planned production capacity is about 850 short tons of ore per day. The concentrates, which will be shipped to a smelter, will contain about 5,700 tons of copper on an annual basis. Byproduct gold and silver will also be recovered.

Arizona mines continued to lead the Nation in the production of **molybdenum**. The output, solely from copper mines, decreased more than 50% from that of 1989 in spite of considerably increased prices in 1990.

The State's largest **gold** mine was Cyprus' Copperstone Mine in La Paz County. At the Congress Mine (Yavapai County), Malartic Hygrade U.S. Inc. completed construction of a carbon-in-pulp gold mill and refinery for $3.4 million. Toward yearend, the mill operated at full capacity of 350 short tons per day. Magma Gold Ltd., a subsidiary of Magma Copper, acquired the idle McCabe Mine in Yavapai County. The underground mine was originally developed on a multi-metal vein bearing gold.

The production of **construction sand and gravel** in Arizona remained fairly constant and put the State in eighth place in domestic output. Other commodities that were produced in important quantities in the State included **lime**, **Portland cement**, and **silver**. In addition, Arizona continued to be among the leaders nationally in the production of naturally occurring **gem stones**.

ARKANSAS

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Annual, Estimated

THE MINERAL INDUSTRY OF ARKANSAS IN 1990

The U.S. Bureau of Mines estimated the value of Arkansas's mineral production in 1990 at $415 million. This was a $33 million increase over the record value reported in 1989. Increased demands for bromine and for both construction and industrial sand and gravel were responsible for the higher mineral value. The State, which ranked 26th nationally in mineral value, was the only U.S. producer of bromine, diamonds, and vanadium.

At midyear the Aluminum Company of America closed its last bauxite mine because of an outdated smelter and inadequate reserves. Strategic Minerals Corp.'s subsidiary, U.S. Vanadium Corp., constructed a Corporate Technology Center at its Garland County facility. The company received the necessary permits to construct a pilot-plant to process tungsten scrap.

Table 1 --Nonfuel mineral production in Arkansas 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Abrasives2/ ---------- metric tons --	1,120	$429	W	W	NA	NA
Clays ---------- do --	844,466	15,376	871,313	$17,391	946,431	$12,105
Gem stones ----------	NA	2,300	NA	4,041	NA	4,585
Sand and gravel:						
Construction --- thousand short tons --	7,722	26,201	e/7,500	e/25,500	8,600	30,700
Industrial ---------- do --	869	6,784	545	5,507	1,000	15,000
Stone:						
Crushed ---------- do --	e/17,100	e/70,100	3/18,791	3/76,419	3/16,600	3/76,900
Dimension ---------- short tons --	e/10,541	e/629	W	W	W	W
Combined value of bauxite, bromine e/, cement, gypsum, lime, stone (crushed slate and dolomite, 1989-90), talc and pyrophyllite, tripoli(1988-89), vanadium (1989-90), and values indicated by symbol W ----------	XX	184,785	XX	253,051	XX	275,377
Total----------	XX	306,604	XX	381,909	XX	414,667

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Grindstones, pulpstones, and sharpening stones; excludes mill liners and grinding pebbles.
3/Excludes certain stones; kind and value included with "Combined value" data.

Employment. In October 1990, the latest month for which data were available, mining employment, was 4,100. Employment was 0.2 percent lower than in October of 1989. These data are from the Arkansas Employment Security Division.

Environment. Reynolds Metals Co. sought Federal and State permits for a plant that would treat spent potliners from aluminum smelters. The treatment would render the liners non-hazardous and suitable for disposal in landfills. The plant would be located at Reynolds' closed Arkadelphia smelter.

Work on a thermal water cascade at Hot Springs National Park was halted by a Federal judge after local citizens noted that the project would violate the National Environmental Policy Act.

Legislation and Government Programs. Drilling at the Crater of Diamonds State Park was halted by a Federal judge after several exploratory holes were drilled. The drilling was funded by Arkansas Diamond Development Co., Continental Diamonds Inc., Kennecott Corp., and Capricorn Diamonds Pty. Ltd. If drilling results had indicated that commercial diamond mining was feasible, an area would have been set aside for tourists to search for diamonds and the remainder of the diamond pipe mined commercially. The drilling was opposed by three environmental groups. In October, the U.S. Department of the Interior appealed the judge's ruling. The park had been established, in part, with Interior funds.

The Department of Energy rejected funding for a gamma ray and neutrino detector to be assembled in the flooded Chamberlain Creek barite mine at Magnet Cove. Although the project would have detected high-energy neutrinos and "could revolutionize scientific understanding and generate worlds of economic opportunities," it was rejected because it had "...no apparent tie to energy conservation."

Arkansas received $7.8 million from the Federal government as its share of 1989 revenues from mineral leases on Federal lands.

Review by Nonfuel Mineral Commodities. The value of the following commodities in descending order accounted for over 75% of Arkansas mineral value: **bromine, crushed stone, portland cement, construction sand and gravel,** and **clays**.

In June, the Aluminum Co. of America (Alcoa) closed its Arkansas **bauxite** mine and 275,000-metric-ton-per-year **alumina** refining operation. The Saline County mine was the last operation in the United Stated producing bauxite for alumina manufacture. The mine closure was necessitated by an outdated smelter and low grade, high-silica bauxite reserves. The company maintained an alumina chemicals operation that obtained feedstock from other Alcoa facilities. The closing affected about 200 employees.

Strategic Minerals Corp. (Stratcor) constructed a Corporate Technology Center at its **vanadium** subsidiary, U.S. Vanadium Corp., in Garland County. Stratcor, a leading global producer of vanadium and **tungsten**, reopened its Arkansas vanadium mine in 1989. In midyear, U.S. Vanadium Corp. received the necessary permits from the Arkansas Department of Pollution Control and Ecology to "...conduct experimental operations (to determine) the feasibility of processing tungsten scrap on a commercial scale."

CALIFORNIA

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Annual, Estimated

THE MINERAL INDUSTRY OF CALIFORNIA IN 1990

California was second among States in the Nation in the value of nonfuel minerals produced during 1990, according to the U.S. Bureau of Mines, accounting for just over 8% of the U.S. total. The value of nonfuel mineral commodities produced during the year was estimated to be $2.7 billion, a 4% decrease from that of 1989. California led all States in the production of asbestos, boron minerals, portland cement, diatomite, calcined gypsum, construction sand and gravel, rare earth concentrates, and tungsten.

Nearby residents' opposition to mining continued to impede the issuing of new mining permits throughout the State, but three county referendums restricting mining in Nevada, Tuolumne, and Yolo Counties were defeated at the polls. Industrial mineral production appeared to be reflecting the leveling off of construction activity in the State, with projected declines in the production of portland cement, lime, sand and gravel, and crushed stone. Increased gold production retained California's standing as the second largest gold producing State despite lower precious metals prices which closed several of the smaller, marginal gold and silver mines.

Employment. According to the California Department of Economic Development, the California nonfuel mining industry employed approximately 9,000 workers in October 1990, down about 4% from the previous year. Of these, 7,000 were nonmetal mining jobs and 2,000 were metal mining jobs.

Exploration. Exploration for precious metals continued in several areas of California, helping the State retain its ranking as the second largest gold producer in the Nation. Eastmaque Gold Mines Ltd. reported exploration drilling on the Oro Cruz Joint Venture Project in Imperial County. Homestake Mining Co., Gold Fields Operating Co., and Bema Gold Corp. were also reported to be exploring in Imperial County. Glamis Gold Ltd. conducted further drilling at the Yellow Aster pit in Kern County. Pegasus Gold Corp. drilled the Virginia Mine site in Mariposa County. Sonoma Mining Corp. explored the Dutch App-Nyman area near Quartz Mountain in Tuolumne County. Royal Gold Inc. began an underground exploration program with Billiton Minerals U.S.A. at its Sixteen to One Mine in Sierra County.

Exploration activities were also reported in the Kelso Dunes area of San Bernardino County, where the U.S. Bureau of Land Management (BLM) reviewed a proposal to conduct a mining operation within the BLM Wilderness Study Area. Sacramento County supervisors reported evaluations of aggregate and incidental gold at Mather Air Force Base, which is scheduled to become county property in 1993 after relinquishment by the Air Force.

Table 1.--Nonfuel mineral production in **California** 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Boron minerals2/ thousand metric tons	578	$429,667	r/562	$429,806	565	$404,476
Cement:						
Masonry thousand short tons	8	730	W	W	W	W
Portland do.	10,423	681,152	10,911	642,020	10,500	619,500
Clays metric tons	2,015,488	31,620	2,195,830	39,243	2,342,092	41,222
Gem stones	NA	3,365	NA	2,982	NA	2,400
Gold3/ kilograms	22,442	316,246	29,804	366,595	32,000	390,952
Gypsum thousand short tons	1,490	11,222	1,734	13,066	1,771	13,743
Lime do.	458	20,242	395	24,503	366	22,703
Peat thousand short tons	2	119	--	--	--	--
Pumice short tons	35,000	1,245	79	4,612	W	W
Sand and gravel:						
Construction thousand short tons	141,946	622,074	e/138,300	e/670,800	127,200	623,200
Industrial do.	2,444	42,078	2,426	43,863	2,400	45,500
Silver3/ metric tons	15	3,148	21	3,650	18	2,894
Stone:						
Crushed thousand short tons	e/49,100	e/275,000	54,887	238,034	44,000	200,600
Dimension short tons	e/42,048	e/5,991	28,829	5,564	30,077	5,213
Combined value of asbestos, barite (1988), calcium chloride (natural) (1988-89), copper, diatomite, feldspar, iron ore (includes byproduct material), magnesium compounds, mercury, molybdenum, perlite, potash, rare-earth metal concentrates, salt, soda ash, sodium sulfate (natural), talc and prophyllite, titanium concentrates (ilmenite, 1989), tungsten ore concentrates, and values indicated by symbol W	XX	334,735	XX	r/369,468	XX	349,940
Total	XX	2,698,654	XX	2,854,206	XX	2,722,343

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/Begining with 1989 data reported in B203. 1988 data converted.

3/Recoverable content of ores, etc.

Environment. The State Regional Water Quality Control Board met in March to discuss the cleanup of the Sulphur Bank Mine near Clearlake which is poisoning fish in the lake with concentrations of mercury. Erosion control construction was scheduled that should be finished by October 1, 1995. The U.S. Environmental Protection Agency (EPA) officially listed the site on its Superfund for Toxic Waste Cleanup in August, clearing the way for EPA oversight of the cleanup.

Legislation and Government Programs. Two bills concerned with mining reclamation and environmental impact reports were passed in September. AB 3551 and AB 3903 require the State Mining and Geology Board in conjunction with local agencies to conduct inspections of all surface mining operations and prepare an environmental impact report on each operation. They also require mine operators to provide financial assurance for costs associated with carrying out a reclamation plan and require that the State Mining and Geology Board adopt minimum, verifiable reclamation standards.

The U.S. Department of the Interior's Minerals Management Service Offshore Operations signed a long-term lease to establish a new office in Camarillo. The new location consolidated offices in Ventura, Santa Maria, and Los Angeles which supervised outer continental shelf minerals exploration and production operations for California, Oregon, Washington, and Hawaii.

The California Division of Mines and Geology released a series of maps entitled "Mineral Land Classification Maps for Nevada County." The two sets of maps denote (1) all land likely to contain precious metals and aggregates, and (2) aggregate resources available for mining.

Review by Nonfuel Mineral Commodities. Permits were issued for several controversial **sand and gravel** operations. Azusa Rock Co. renewed its permit to mine its Fish Canyon Road Quarry.

Placer County supervisors approved a use permit for R. C. Collet Inc. to begin aggregate mining near the Stanford Ranch in Rocklin. Ventura County supervisors approved a new sand and gravel mining operation on an 80-acre site north of Moorpark.

Calaveras Cement Co. continued construction of additional facilities at its new **cement** plant at Monolith in Kern County, including a "stacker-reclaimer" storage dome and a new kiln. Onoda Cement Co. of Japan acquired the California Portland Cement Co. Unit, which includes the Slover Mountain Property in Colton, from CalMat Co. CBR Group of Belgium acquired Standard Concrete Products, a ready-mix concrete company with several California operations, in September.

Homestake Mining poured its one-millionth ounce of **gold** since it began production in 1983 at its Napa County McLaughlin Mine. Gold Fields Operating began development of the Rainbow pit at its Mesquite Mine in Imperial County. U.S. Gold Corp. and AMAX Gold Inc. continued development at their Hayden Hill gold project in Lassen County of a conventional processing mill and cyanide heap leach processing facility. Glamis Gold purchased all of Echo Bay Mines Ltd.'s Randsburg gold properties, 5,600 acres, including the Baltic and Lamont deposits. Royal Gold reopened the original Sixteen to One Mine near Downieville in July. Startup operations included mine repair and reconditioning of track, equipment, and the hoisting system.

COLORADO

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Annual, Estimated

THE MINERAL INDUSTRY OF COLORADO IN 1990

The estimated value of nonfuel minerals produced in Colorado in 1990 was $405.3 million, according to the U.S Bureau of Mines. This is an 11% decline in value following last year's 25% increase. Declining output of molybdenum, historically Colorado's largest nonfuel mineral product, accounted for the lower total value. Of Colorado's other metallic products, copper, gold, silver, and vanadium also experienced reductions in output and value; zinc saw a moderate increase in output while total value remained the same, and lead production remained virtually unchanged but value rose. The decline in molybdenum output took place despite an increase in price. Construction sand and gravel output remained little changed from the 1989 level and, with the decline in molybdenum output, was the State's leading nonfuel mineral product. Production of the State's other major construction minerals, portland cement and crushed stone, also rose, as did gypsum and lime. A dramatic increase in output of dimension stone reflects its increased architectural popularity.

The total value of nonfuel minerals produced in Colorado has generally reflected the fortunes of molybdenum in the past several decades. Demand for molybdenum has declined with the decline in output of the U.S. steel industry, the major consumer of molybdenum produced. Colorado nonfuel output fell from a peak of $1,265 million in 1980 to one-third of that amount in 1982, and has remained near that level since. Colorado ranked 27th among the 50 States with 1.21% of the total value of nonfuel minerals produced in the Nation.

Among the good news in mining in the State was the November announcement by Climax Molybdenum Inc. that it planned to reopen the Climax Mine in 1992, adding about 70 employees to the 175 who have been doing reclamation work at the site since mining ceased in March 1987. Climax's other large molybdenum mine in Colorado, the Henderson Mine, continued producing at a reduced level.

Employment. Mining employment was estimated to be 18,500 persons in 1990. About 3,400 were employed in the metal mining sector, 2,900 in coal and nonmetals, and 12,200 in petroleum and natural gas.

Table 1.--Nonfuel mineral production in Colorado 1/

Mineral	1988 Quantity	1988 Value (thousands)	1989 Quantity	1989 Value (thousands)	1990e/ Quantity	1990e/ Value (thousands)
Clays ---------- metric tons --	247,471	$1,890	265,435	$2,064	313,061	$2,316
Copper2/ ---------- do. --	898	2,386	W	W	771	2,108
Gem stones ----------	NA	100	NA	240	NA	240
Gold2/ ---------- kilograms --	5,126	72,237	3,448	42,411	3,267	39,914
Peat ---------- thousand short tons --	W	W	W	412	W	W
Sand and gravel (construction) thousand short tons --	21,566	69,882	e/25,300	e/104,000	24,100	104,100
Silver2/ ---------- metric tons --	27	5,588	W	W	23	3,697
Stone:						
Crushed -------- thousand short tons --	e/10,600	e/42,400	3/7,261	3/32,435	7,600	36,100
Dimension ---------- short tons --	e/3,450	e/143	5,310	398	8,490	1,394
Combined value of cement, gypsum, lead, lime, molybdenum, perlite, sand and grave (industrial), stone (crushed traprock, 1989-90), vanadium, zinc, and values indicated by symbol W ------	XX	169,379	XX	r/273,204	XX	215,446
Total----------	XX	364,005	XX	455,164	XX	405,315

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Recoverable content of ores, etc.
3/ Excludes certain stones; kind and value included with "Combined v

Exploration. The second largest gold nugget ever found in Colorado was discovered in the summer of 1990. The nugget, which weighs 8 troy ounces, was found on the alpine slopes of Pennsylvania Mountain, west of Alma (Park County). Named "The Turtle Nugget," it is 1.5 inches wide and 3 inches long. Colorado's largest gold nugget, weighing 12 troy ounces and measuring 3 inches by 2 inches, was found at the same site in 1937. Both are now at the Denver Museum of Natural History's Coors Mineral Hall.

Exploration and development continued at several properties in various gold and silver mining districts. In Teller County, Gold State Mining Co. was reconstructing an 1890 shaft and building a new gold-processing mill near Victor (Teller County). Pikes Peak Mining Co. conducted an extensive exploration effort in the Cripple Creek and Victor mining district, near its Carlton mill.

Tenneco Minerals finished its 1990 drilling program about July 1 and pulled rigs off a site north of Silver Cliff (Custer County). The firm planned to strip mine silver and build a $35 million mill at the town of Silver Cliff. Nova Natural Resources Corp. of Denver drilled on the Bassick Mine gold properties near the ghost town of Querida, about 7 miles east of Silver Cliff.

The reopened Summitville Mine (Rio Grande County) lost money on its 1990 startup but continued its gold exploration program, funded at $300,000 in 1990. Several potentially good targets had been identified by the operator, Summitville Consolidated Mining Co. Inc. (subsidiary of Galactic Resources Inc.). The company planned to mine underground if targets prove out. The Summitville open pit has been the most productive gold mine in the State since 1986, except for 1989 when it shut down early in the season.

Idarado Mining (subsidiary of Newmont Mining Corp.) has been doing exploration drilling yearly, spending between $25,000 and $100,000, at the Idarado Mine (San Miguel and Ouray Counties). Idarado hopes to find enough gold ore to build a mill on the Ouray side of the mountain. The Idarado Mine has been closed since 1978.

Environment. Environmental issues continued to be important to the mining industry in the State. Some crushed stone operations in El Paso County were closed or forced to consider new mining plan options because of environmental considerations.

Cleanup work of toxic metals at the Eagle Mine, a Superfund site, has not been as effective as planned. New problems have been created by some of the chosen reclamation techniques. Early plans to

plug mine openings or move piles tended to be either controversial or unworkable. New contamination was caused when plugged openings leaked and tailings spewed dust as they were moved to a new site. The contaminated Eagle River water may have to be treated in perpetuity; the new treatment plant itself created sludge, and no way has been found to dispose of it. The Eagle County Oversight Committee filed a $300 million class-action lawsuit against the owner of the site, Paramount Communications, on September 5. The suit alleged that current cleanup efforts were inadequate. Paramount had spent a reported $35 million on the cleanup since purchasing the mine in 1968, according to its attorneys.

Anxiety in the north Denver neighborhood of Globeville, near ASARCO Incorporated's smelter, resulted in Denver Housing Authority (DHA) officials deciding to move residents out of the 232-unit Stapleton Homes project. Contamination from the smelter, which processes materials that contain arsenic, cadmium, and lead, was suspected. The Colorado Department of Health and the U.S. Environmental Protection Agency, however, have found little evidence that residents face health risks.

Legislation and Government Programs. Two bills concerning the mineral industry were signed by the governor during the spring 1990 session. House Bill 1205 doubled the fee to dispose of solid waste in landfills. The new fee will increase the State's hazardous waste emergency response fund for use in Superfund actions. Bill 1205 also extended the fund to 1997 and prohibited funds from being used for new litigation. Senate Bill 77 created a State uranium mill tailings remedial action fund to serve as a source of State matching monies under the Federal Uranium Mill Tailings Remediation and Control Act. The bill also requires the Colorado Department of Health to report annually to a legislative oversight committee on the progress of cleanup.

Review by Nonfuel Mineral Commodities. The Summitville **gold** mine's production in the first half of 1990 was 6,963 troy ounces, compared with 17,848 ounces produced in the first half of 1989. Mining was delayed following a shutdown in June 1989 because of concerns about a crack in the tailings pond embankment. Operations restarted in May 1990. The open-pit mine, at 11,700 feet in Rio Grande County, closes for the winter, usually in early November.

The new Orleman Wallboard **gypsum** plant at Gypsum was started up in September. Wallboard is being shipped from Eagle County by rail and truck as far as California and Utah. About 75 employees, mostly in the plant, work for EagleGypsum Products, which is a Colorado limited partnership between Eagle Gypsum Ltd. and Eagle Investment Group, an Illinois limited partnership. The nearby mine has supplied gypsum for years to such users as Ideal Basic Industries Inc. (now called Holnam Inc.).

On October 26, Climax Molybdenum Co. (a subsidiary of AMAX Inc.) announced that it will reopen its Climax **molybdenum** mine in 1992. The mine is north of Leadville, in Lake County. Leadville's population declined from 8,830 to 6,000 when Climax was closed in 1987. About 250 workers will be employed in 1992, compared with the 3,000 the firm employed at Climax in the late 1970's and early 1980's.

Production of **dimension stone** during 1990 was estimated to have increased significantly. Closed since 1942, the Yule Marble quarry reopened in September 1990 and the first slab of white marble was transported from Gunnison County to Tennessee for testing. Production of about 1,100 35,000-pound, 5-by-5-by-8-feet blocks per year was projected. First opened in 1900, the Yule Marble quarry provided the pure white stone for the Lincoln Memorial, the Tomb of the Unknown Soldier, the Denver Post Office, and numerous other monuments and buildings erected in the 42-year period it was in operation. Quarry managers also were planning for 5,000 to 15,000 visitors per year to the picturesque quarry.

Revival of interest in dimension stone for building affected red sandstone production in the Lyons area as well. The Sandstone Institute funded by a small economic development grant from Boulder County was created to help steer potential quarry operators through the mine application process.

After an encouraging reopening of about two dozen **vanadium/uranium** mines in 1989, Umetco Minerals Corp. closed down operations in November 1990. Umetco's operations employed 83 workers--58 miners at La Sal, Utah, and Dove Creek, Colorado, and 25 at the White Mesa mill, south of Blanding, Utah. Duration of the shutdowns depends upon turns in the uranium market.

CONNECTICUT

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Annual, Estimated

THE MINERAL INDUSTRY OF CONNECTICUT IN 1990

The value of nonfuel mineral production in Connecticut in 1990 was estimated by the U.S. Bureau of Mines to be $108 million. This value represents a decrease of $5 million from that of 1989, primarily the result of lower sales of crushed stone, the State's leading mineral commodity in terms of value. Other commodities produced included construction sand and gravel, clays, dimension stone, feldspar, industrial sand, and mica.

Like many producers in other New England States, aggregate producers in Connecticut have been experiencing lower demand from one of their primary consumers, namely the construction industry. In 1990, construction aggregates (crushed stone and construction sand and gravel) accounted for more than 90% of Connecticut's mineral value. Overbuilding in the past several years had occurred in the residential, commercial, and industrial markets. Sellers were having a difficult time selling these properties because buyers were waiting to see whether interest rates would drop. However, continuing highway and infrastructure repairs kept some aggregate producers' heads above water in 1990. Many of these highway projects were funded by the $7.1 billion, 10-year Transportation Infrastructure Renewal Programs established in 1984.

Table 1 --Nonfuel mineral production in Connecticut 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$2	NA	$2	NA	$2
Mica (scrap) --- thousand metric tons --	5	275	5	188	W	W
Sand and gravel (construction):						
thousand short tons --	8,275	32,102	e/5,800	e/24,700	6,200	27,700
Stone:						
Crushed ---------- do --	e/11,400	e/76,900	2/11,480	2/78,734	2/9,700	2/70,600
Dimension ---------- short tons --	e/19,718	e/1,914	W	W	W	W
Combined value of clays (common), feldspar, sand and gravel (industrial), stone (crushed granite, 1989-90), and values indicated by symbol W ----------	XX	6,923	XX	9,780	XX	9,975
Total----------	XX	118,116	XX	113,404	XX	108,277

e/Estimated. NA Not available. XX Not applicable
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Excludes certain stones; kind and value included with "Combined value" data.

Environment. The Connecticut Hazardous Waste Management Service (CHWMS) started a program to evaluate innovative uses of technology that minimize hazardous waste and prevent pollution.

The Service had received a $300,000 grant from the Environmental Protection Agency (EPA) for Waste Reduction Innovative Technology Evaluation (WRITE) pilot projects. Connecticut was one of six States invited by the EPA to apply for the grant. The CHWMS will provide up to $100,000 in matching funds.

Legislation and Government Programs. A Milford Superior Court judge ruled in January that the Beacon Falls Planning and Zoning Commission amendments to the town's zoning laws, which banned three mining companies from processing imported gravel, were illegal. The judge upheld appeals filed by O&G Industries Inc., D&J Quarry Products Inc., and Hamden Sand & Gravel Co., thus nullifying the amendments passed by the Planning and Zoning Commission in 1988. The amendments would have barred the companies from bringing crushed stone and sand and gravel to Beacon Falls from other towns as of January 1, 1990. The amendments also would have prohibited the companies from processing existing stockpiles of those materials as of January 1991. The judge ruled that because the companies were already operating locally before the amendments were adopted, the town cannot prevent them processing the material there.

Review By Nonfuel Mineral Commodities. In December, 14 **sand and gravel** operators in the Township of Plainfield filed a written protest against the Plainfield Planning and Zoning Commission's efforts to impose new regulations in the township concerning mining activities. The gravel operators, most of whom are grandfathered, objected to the proposal of having to file permit applications for pre-existing gravel operations. Other conditions in the regulations include restricting operating hours, regulating topsoil restoration and stockpiled materials, and limiting the annual amount of sand and gravel that may be mined in a year to 25,000 cubic yards. The new regulations are expected to be challenged in court.

In November, the East Granby Planning and Zoning Commission denied Roncari Industries' proposal to expand its **crushed stone** quarry operations by 116 acres. The company, which quarries about 70 acres, applied to change the zoning of additional acres it owns from that of agriculture to quarry. Commission members voted 6-0 not to change the zoning and cited their inability to predict Roncari's future as their reason. Roncari officials said it would take about 55 years to quarry the whole parcel. Some members of the Commission agreed that they would like to see the quarry expansion occur in smaller steps, rather than one zone change for the whole parcel. The Commission was also uncertain about how considerate new owners might be if Roncari sold the operation. The Commission chairman indicated the issue would be clarified in a revised town plan.

Near yearend, the Utility Contractors Association of Connecticut (UCAC) voted to merge with the Connecticut Construction Industries Association (CCIA). The CCIA represents many **sand and gravel** and **crushed stone** operators in the State. Under the merger, which becomes effective January 1, 1991, the UCAC will become a full division within the CCIA.

DELAWARE

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Annual, Estimated

THE MINERAL INDUSTRY OF DELAWARE IN 1990

The value of construction sand and gravel production in Delaware in 1990 was about $8 million according to estimated data compiled by the U.S. Bureau of Mines. Magnesium compounds were also produced, but the output and value of this commodity are excluded from the State total to avoid disclosure of company proprietary data.

Construction of a major roadway to serve as a bypass around the city of Dover continued during the year. Crushed stone used in building the bypass was trucked into Delaware primarily from adjacent States. This construction project resulted in a proposal in 1989 for building stone depots along rail lines in Camden, Felton, and other sites. Rezoning and local government approval was not received for the depots and the plans were cancelled in 1990.

Table 1 --Nonfuel mineral production in Delaware 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$1	NA	$1	NA	$1
Marl (greensand) short tons	750	10	--	--	--	--
Sand and gravel (construction) thousand short tons	1,933	5,988	e/1,900	e/6,200	2,300	7,900
Total2/	XX	5,999	XX	6,201	XX	7,901

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data.
XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Partial total, excludes values which must be concealed to avoid disclosing company proprietary data.

Legislation and Government Programs. A clean environment was a major priority in Delaware because of the revenue generated from tourism. In 1990, the Delaware General Assembly enacted House bill 391 requiring immediate notification of the discharge of a pollutant. Under the legislation, the Delaware Department of Natural Resources and Environmental Control (DNREC) adopted regulations listing substances to be reported, which included discharge of petroleum substances into surface waters, groundwater, or on land. The regulations were the most stringent of those contained in the Comprehensive Environmental Response Compensation and Liability Act, the Clean Air Act, or previous DNREC regulations.

The DNREC, Water Resources Division, was authorized under House bill 368 to develop regulations for the extraction of sand from borrow pits. The State's sand and gravel industry was also expected to be regulated under this legislation. Public hearings and meetings to formulate the regulations were scheduled for 1991 with implementation expected by early 1992.

House bill 520, which would have removed an exemption that permitted a steel manufacturing plant to remain operating in a coastal zone area, was vetoed by the Governor. The legislation, if enacted, would have closed Delaware's only operating steel plant. The legislation was proposed because of a dispute about the reemployment of steel workers who worked at the plant before it changed ownership in 1988.

The DNREC received a $258,000 grant from the U.S. Environmental Protection Agency to develop a State-wide program to assist business and industry in minimizing wastes.

Review By Nonfuel Mineral Commodities. The 1990 estimated production of 2.3 million short tons of construction **sand and gravel** was the highest total since 1987.

Delaware remained one of six States that produced **magnesium compounds**, which were used primarily in the manufacture of pharmaceutical products.

Delaware also received shipments of mineral commodities from other States and countries. Shipments of large quantities of minerals were handled primarily at the Port of Wilmington. Among the commodities received in 1990 were steel, crude gypsum, aluminum, magnesite ore, aluminum sulfate, and petroleum.

Titanium sand, mined in Florida by E. I. du Pont de Nemours & Co., was shipped to the firm's **titanium dioxide** plant in Wilmington. In 1990, Du Pont announced plans to increase plant capacity by 350,000 tons per year to 1 million tons by the mid-1990's. Titanium dioxide is a pigment used in paints and to make other coatings.

FLORIDA

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Annual, Estimated

THE MINERAL INDUSTRY OF FLORIDA IN 1990

The value of Florida's nonfuel mineral production in 1990 was estimated by the U.S. Bureau of Mines at $1.5 billion, a decrease of $78 million below the value in 1989. The decline was due, primarily, to a drop in the demand for masonry and portland cement and for crushed stone. This reflected the downturn in construction activity in Florida during the year. Value for these three construction mineral commodities decreased almost $74 million. Despite the downturn, the State remained the Nation's leader in phosphate rock and ranked among the top three in crushed stone, masonry cement, and peat output. Florida continued to rank 5th nationally in total mineral value, 2nd in the value of industrial mineral sales, and 19th in metal production.

Consolidated Minerals Inc. announced plans to seek permits to allow the construction of a power, chemical, and cement plant complex and an associated phosphate mine in De Soto County. Gardinier Inc. announced that it would spend $5 million to cover its Hillsborough County gypsum stack and restore former marsh lands. IMC Fertilizer Inc. obtained permits to construct a new gypsum stack in Polk County, and Royster Phosphate Inc. received the okay to begin construction of a new sulfuric plant in Manatee County. Nu-West Industries Inc. sold its Manatee County subsidiary, Nu-Gulf Industries, including the Wingate phosphate mine, to the Gulf Atlantic Corp.

Employment. Mining employment declined from a high of 9,600 in February, to 9,300 in August, the latest month for which data were available.

Environment. A major environmental problem facing the Florida mining industry is the disposal of byproduct gypsum produced during fertilizer manufacture. These gypsum "stacks" can cover several dozen acres and reach a height of 200 feet. Rain water seeping through the stacks leaches minerals that can pollute surface and ground waters. Current mitigating technology consists of covering the stacks with a heavy plastic and covering the plastic with soil.

Water contamination was indicated from other operations. Contaminated water zones from subsurface waste injection were discovered above a confining layer in the Lower Floridian aquifer at a waste injection site in Brevard County. The staff of the Florida Geological Survey began a detailed analysis of the aquifer system to better understand and mitigate the problem.

Table 1.--Nonfuel mineral production in **Florida** 1/

Mineral	1988 Quantity	1988 Value (thousands)	1989 Quantity	1989 Value (thousands)	1990e/ Quantity	1990e/ Value (thousands)
Cement:						
Masonry -------- thousand short tons --	411	$25,892	477	$31,231	290	$19,200
Portland ------------------------- do.--	3,682	168,719	4,357	207,857	3,600	169,200
Clays ------------------- metric tons --	536,922	44,423	2/563,687	2/46,941	2/578,472	2/48,652
Peat ------------ thousand short tons --	266	5,091	235	4,515	223	4,256
Sand and gravel:						
Construction --------------------- do.--	18,654	53,083	e/17,900	e/55,500	15,700	51,200
Industrial ----------------------- do.--	636	6,928	681	7,768	605	6,830
Stone (crushed) ------------------- do.--	e/ 3/83,200e/	3/374,400	83,995	341,307	74,500	317,400
Combined value of clays (common, 1989-90), gem stones, magnesium compounds, phosphate rock, rare-earth metal concentrates, staurolite, stone (crushed marl 1988), titanium concentrates (ilmenite and rutile), and zircon concentrates ----------	XX	713,345	XX	913,054	XX	913,021
Total--------------------------------	XX	1,391,881	XX	1,608,263	XX	1,529,759

e/Estimated. NA Not available. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" data.
3/Excludes certain stones; kind and value included with "Combined value" data.

Legislation and Government Programs. Staff of the Florida Geological Survey and Division of State Lands were directed by the Governor to review exploration policies for hydrocarbons on or over State-owned submerged lands and in State water conservation areas.

The Florida Geological Survey continued work on a new State Geological map. At yearend, draft maps had been completed for 25 counties and preliminary mapping completed for an additional 12 counties. The final completion date was projected to be 1995 or 1996.

Review by Nonfuel Mineral Commodities. **Phosphate rock** was the leading mineral commodity mined in Florida; the commodity accounted for over 50% of the State's mineral value. **Crushed stone** and **portland cement** were the second and third leading commodities in terms of value.

In the phosphate segment of the industry, Consolidated Minerals Inc. began preliminary talks with State, regional, and local officials on a proposed phosphate mine-**cement** factory-power plant complex in De Soto County. The $1 billion project would produce 4 million tons of phosphate rock, 2.5 million tons of cement, and 1 million tons of phosphate fertilizer annually. The 17,000-acre complex would contain a 600-megawatt electrical generating plant.

Gardinier Inc.'s phosphate fertilizer operations have generated **byproduct gypsum** that covers 400 acres to a depth of 200 feet. Sulfides and fluoride minerals have been leached into a nearby waterway, and the company began work to seal the stack. The top was flattened, a high-density polyethylene plastic material spread over the stack, and the plastic covered with soil.

Permission to build a new gypsum disposal stack was granted to IMC Fertilizer Inc. The company's current stack, which covers 775 acres, will reach a height of 200 feet by 1992. The new stack will be constructed on mined land in an isolated area in western Polk County.

Royster Phosphates Inc. received permission from Manatee County Commissioners to construct a new $50-million **sulfuric acid** plant at the Company's manufacturing complex at Piney Point. The new plant will replace a 24-year-old facility and will increase acid output by 35%.

Ideal Basic Industries completed the first full year of operations at its new **limestone** quarry at Crystal River. Stone from the quarry was barged to the company's cement plant in Mobile, Alabama.

GEORGIA

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Annual, Estimated

THE MINERAL INDUSTRY OF GEORGIA IN 1990

The U.S. Bureau of Mines estimated the value of nonfuel minerals produced in Georgia in 1990 at $1,477 million, a record high for the eighth consecutive year. This was a 6.5% increase over the $1,387 million produced in 1989. The increase occurred despite indications the State was in a mild recession, especially with respect to the construction industry.

A 3% increase in the value of kaolin and an estimated 21% increase in crushed stone were primarily responsible for the new record value. Georgia was the Nation's leading producer of kaolin, a clay used in the manufacture of paper, paint, and plastic products. Clays and crushed stone were the most valuable mineral commodities mined in Georgia.

Georgia continued to lead the Nation in the quantity and value of total clays mined, as well as two specific types of clay, kaolin and fuller's earth. It also led the Nation in the value of barite and natural iron oxide pigments and in the quantity of granite dimension stone. Overall, Georgia retained its ranking of third, behind California and Florida, in the value of industrial minerals produced and rose from eighth in 1989 to seventh in the value of all mineral commodities produced.

Table 1 --Nonfuel mineral production in Georgia 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	10,274,358	$908,771	9,768,312	$1,004,954	9,884,180	$1,032,749
Gem stones ----------	NA	20	NA	21	NA	21
Sand and gravel:						
Construction --- thousand short tons --	9,526	30,185	e/6,100	e/18,900	6,000	19,600
Industrial ---------- do --	W	W	537	7,013	495	6,690
Stone:						
Crushed ---------- do --	e/57,400	e/317,200	50,417	262,805	58,000	317,300
Dimension ---------- short tons --	e/190,472	e/27,768	2/145,545	2/12,087	164,624	23,287
Talc and pyrophyllite --- metric tons --	23,587	260	W	W	W	W
Combined value of barite, bauxite, cement, feldspar, iron oxide pigments (crude), mica (scrap), peat, stone (dimension marble, 1989), and values indicated by symbol W ----------	XX	89,621	XX	81,515	XX	77,775
Total----------	XX	1,373,825	XX	1,387,295	XX	1,477,422

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain stones; kind and value included with "Combined value" data.

Exploration. The Minerals Management Service, working jointly with the Georgia Geologic Survey and the U.S. Bureau of Mines, successfully completed an exploratory drill hole in the waters off Tybee Island despite opposition from environmental groups. Additional test drilling to help evaluate the underwater phosphate deposits and potential effects that mining could have on the marine environment was scheduled for 1991.

Exploration also continued at the Royal Vindicator gold prospect south of Tallapoosa in extreme west-central Georgia even though a mining permit issued for the mine in 1988 was revoked by the Georgia Environmental Protection Division.

Exploration by private companies for feldspar, talc, and heavy minerals in ancient beach sands was also reported.

Legislation and Government Programs. Legislation affecting the mineral industry during 1990 was restricted to the enactment of two bills related to hazardous waste reduction plans that were more restrictive than U.S. Environmental Protection Administration guidelines, and a bill severely limiting the percentage of phosphorus that could be used in cleaning agents.

The State of Alabama filed suit in U.S. District Court to block allocation of water flowing into Alabama from Georgia. The suit requested the court to prevent the U.S. Corps of Engineers from guaranteeing Georgia water for future growth without considering Alabama's needs. Florida later joined Alabama in the suit.

Review by Nonfuel Mineral Commodities. Clays, valued at over $1 billion, accounted for 70% of the total value of minerals produced in Georgia and for 65% of the value of all the clays produced in the United States. **Kaolin, fuller's earth,** and **common clay and shale** were mined.

The major development affecting the clay industry was the pending purchase of Georgia Kaolin Co., the State's second largest kaolin producer, by ECC America Inc. (ECCA), parent of the third largest producer in Georgia. Terms of the sale were agreed upon by the companies involved in April, but actualization has been delayed by a U.S. Department of Justice (USDJ) investigation to determine if the merger is consistent with anti-trust laws. As of yearend, the principals were still waiting on a final USDJ decision.

Mullite Corp. of America (Mulcoa), was also sold in 1990. Both Georgia Kaolin and Mullite were divisions of C-E Minerals Corp., which is owned by Asea, Brown, Boveri Ltd., a Swedish/Swiss conglomerate. Mulcoa, which produces mullite from bauxitic kaolin and **bauxite**, was sold to Imetal, a French industrial holding company.

The increase in **crushed stone** production was unexpected since the proposed developments expected to result in increased crushed stone production during the 1990's have not yet taken effect. These developments included building an outer belt highway around Atlanta, construction related to the 1996 Olympic games, construction of a new regional airport to serve the Atlanta area, and increased gasoline taxes to finance an accelerated highway program. Developments affecting the crushed stone industry were primarily related to permitting new quarries along the route of the proposed outer belt highway in north-central Georgia. In every case, applications for zoning and mining permits were strongly opposed by local residents and environmentalists.

Georgia once again led the nation in the value of **barite** produced, although it lagged far behind Nevada in volume mined. This resulted from Georgia barite being sold to the high-value end use markets: fillers, extenders, pigments, and barium chemicals. In contrast, Nevada barite was primarily sold to the high-volume, low-value drilling mud market. The volume of barite mined in Georgia decreased slightly, but because of higher unit prices the value increased substantially.

Mineral commodities whose value increased over 1989 were **construction sand and gravel**, which exhibited a modest increase in value, and **portland cement, dimension stone**, and **feldspar**, which increased in both volume produced and total value.

All other mineral commodities produced in Georgia decreased in both tonnage produced and value from 1989. These commodities included: **industrial sand and gravel, bauxite, masonry cement**, scrap **mica, peat**, and **talc.**

Several other mineral commodities were manufactured into higher value products from minerals that are mined in Georgia or shipped into the State. These value-added commodities are not included in Table 1 but are important to the State's mineral economy. Included are the following industrial minerals: aragonite, brucite, high-brightness marble, celestite, gypsum, iodine, perlite, rutile, slag, and vermiculite. Metals in this category included aluminum, copper, steel, and zinc.

Significant developments related to these commodities included ECCA's closing of the Thompson Weinman & Co. calcium carbonate plant in Cartersville, which they acquired from Cyprus Mines Corp. in 1988. This was one of the first plants in the Nation to produce finely ground calcium carbonate products. Newfoundland Resources and Mining Co. Ltd. began exporting crushed limestone into Georgia through the Port of Savannah. The company operated its own docking and unloading facilities and maintained a 100,000- to 150,000-short-ton stockpile at the Savannah site.

Southwire Co. of Carrollton became one of the Nation's largest aluminum and copper scrap consumers and rod producers when it acquired full ownership of a major primary aluminum smelter and majority control of a copper refinery, both located outside Georgia. Atlantic Steel began consolidation of its operations at Cartersville. Its Atlanta operations were scheduled to be closed in 1991.

HAWAII

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Annual, Estimated

THE MINERAL INDUSTRY OF HAWAII IN 1990

The value of Hawaii's nonfuel mineral production in 1990 was estimated by the U.S. Bureau of Mines to be $103 million an increase of 12% from that of 1989. Based on preliminary statistics, Hawaii ranked 44th nationally in the value of 1990 nonfuel mineral production. Crushed stone, sand and gravel, and portland cement were the principal mineral commodities produced.

Mineral production in Hawaii is mainly for local construction usage. From 1985, to 1989, total construction spending increased at unprecedented rates, exceeding $3 billion in 1989. According to the Bank of Hawaii, construction activity during 1990 appeared at yearend to be approaching their predicted $3.5 billion, indicating continuing but moderating growth. Total construction put-in-place (the value of work done on which contractors pay State taxes) was $1.9 billion for the first seven months of 1990, 6% ahead of the same period for 1989.

The U.S. Department of the Interior and the University of Hawaii's Look Laboratory released the final Environmental Impact Statement (EIS) on mining manganese nodules from the ocean floor near Hawaii on November 15, 1990, culminating a 6-year effort by a State-Federal task force. The EIS addressed 10 potential seamount mining sites pointing to the possibility of a new source of cobalt, manganese, nickel, and platinum ore for American industry as well as new economic opportunities for the State of Hawaii. Researchers at the University of Hawaii continued to seek methods of breaking down the manganese crusts into their various mineral components and disposing of the waste.

Grove Farm Rock Co. completed expansion of its aggregate facility on the Island of Kauai. Additional screening and conveyor capacity was installed to complement the increased crusher capacity expansion begun in 1989 at their basalt quarry.

Table 1.--Nonfuel mineral production in **Hawaii** 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry -------- thousand short tons --	10	$1,531	10	$1,566	10	$600
Portland ------------------------- do.--	354	28,880	493	40,495	500	41,500
Gem stones ------------------------------	NA	W	NA	44	NA	44
Sand and gravel (construction) --- do.--	652	3,173	e/600	e/3,200	1,000	5,600
Stone (crushed) ------------------ do.--	e/5,700	e/41,000	6,205	46,746	7,000	55,400
Combined value of other industrial minerals and value indicated by symbol W ----------	XX	348	XX	(2/)	XX	(2/)
Total------------------------------	XX	74,932	XX	3/92,051	XX	3/103,144

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/Value excluded to avoid disclosing company proprietary data.

3/Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

IDAHO

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Annual, Estimated

THE MINERAL INDUSTRY OF IDAHO IN 1990

The estimated value of nonfuel mineral production for Idaho in 1990 was $344.2 million, a decrease of 6% from 1989, according to the U.S. Bureau of Mines. An increase in the value of lead, phosphate, crushed stone, and zinc production was more than offset by a drop in the value for gold, molybdenum, and silver. The metallic minerals--antimony, copper, gold, lead, molybdenum, silver, vanadium, and zinc--accounted for slightly more than 50% of the State's nonfuel mineral production value. Idaho ranked 31st nationally in that value.

Phosphate was the highest valued mineral commodity produced in Idaho and, although production remained essentially the same as in 1989, had the largest absolute value increase in 1990. Expansion and renovation work continued throughout the year at many of the phosphate mines and plants. The drop in silver prices resulted in some miners being furloughed and anxiety over the possibility of additional layoffs and even mine closures, especially in the Coeur d'Alene mining district. Lead and zinc production in Idaho rose substantially in 1990. Estimated production increased almost 42% in quantity and more than 56% in value from that of 1989.

Exploration. With about 80 projects in Idaho, exploration was nearly as active in 1990 as in 1989. Gold continued to be the metal of choice, although there appeared to be a resurgence of interest in base metal properties.

In north Idaho, drilling was done by Cominco Ltd. on Scout Mountain, by Newmont Exploration Ltd. at Legett Creek near Golden, and Goldfields Mining Corp. had a major program at Florence. In the Salmon area, FMC Gold Corp. and American Gold Resources Corp. (AGR), in a joint venture, continued work on the Arnett Creek property; Placer Dome Ltd. and AGR explored targets around Leesburg and Shoup; Goldfields drilled the Bobcat Gulch property; Teck Exploration Ltd. explored in the King Solomon Mine area; and Hecla Mining Co. assessed claims near Williams Pass.

In central Idaho, Stow Resources Ltd. drilled at the Franklin D. Mine in Valley; Kennecott Exploration Co. at the Moscow Mine near Big Creek; Independence Mining Co. at Smith Creek; and Sunshine Mining Co. at Valley Creek and Washington Basin. Westmont Mining Inc. searched for base metals in the Boulder Mountains and Placer Dome continued evaluation of the Red Mountain prospect. Newmont drilled at its Rocky Bar property and explored on Caribou Mountain in southeastern Idaho with Independence Mining. Nerco Exploration Co. and Battle Mountain Gold Co. were two of many companies active in Owyhee County.

Table 1 --Nonfuel mineral production in **Idaho 1/**

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- metric tons --	8,519	W	W	W	8,519	W
Copper3/ ---------- do. --	2,269	$6,028	2,950	$8,516	2,331	$6,372
Feldspar ---------- short tons --	--	--	12,800	720	W	W
Gem stones ----------	NA	500	NA	500	NA	500
Gold3/ ---------- kilograms --	5,218	45,349	3,057	37,602	2,735	33,414
Phosphate rock - thousand metric tons --	4,706	81,011	W	W	W	W
Sand and gravel:						
Construction --- thousand short tons --	6,914	19,897	e/5,800	e/18,900	6,100	20,900
Industrial ---------- do. --	483	5,089	459	5,037	465	5,050
Silver3/ ---------- metric tons --	340	71,512	439	77,651	414	66,552
Stone (crushed) - thousand short tons --	e/3,400	e/13,100	3,298	12,609	4,000	16,000
Combined value of antimony, cement, clays, (bentonite, common, kaolin), garnet (abrasive), lead, lime, molybdenum (1989), perlite, pumice, stone (dimension), vanadium, zinc, and values indicated by symbol W -------	XX	48,130	XX	304,775	XX	195,397
Total----------	XX	290,616	XX	366,310	XX	344,185

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/Excludes certain clays; kind and value included with "Combined value" figure.

3/Recoverable content of ores, etc.

Environment. During the summer, six mining companies, a railroad owner, and a chemical manufacturer agreed to prepay $3.18 million to the Bunker Hill Superfund project to clean up heavy metals in the Kellogg area. The goal of the program was to remove toxic metals, primarily lead and cadmium, from 100 residential properties. Those contributing to the cleanup were Gulf Resources and Chemical Corp., Hecla, Asarco Inc., Callahan Mining Corp., Coeur d'Alene Mines Corp., Stauffer Chemical Co., Sunshine Precious Metals Inc., and the Union Pacific Railroad.

FMC Corp. agreed to invest more than $20 million over the next three years to make improvements in air quality controls at its elemental phosphorus plant west of Pocatello, the nation's largest. J.R. Simplot Co. announced it shut down three phosphate ore calciners at its Pocatello fertilizer plant to cut particulate emissions. To further reduce dust emissions, Simplot continued work on an estimated $30 million slurry pipeline between the company's Smokey Canyon phosphate mine and the Pocatello plant.

Legislation and Government Programs. The State of Idaho initiated a new and unique method of helping silver producers in the Coeur d'Alene mining district. The State Lottery Commission inaugurated a new "scratch" game in which top prize winners received cash along with silver and gold bullion minted by Sunshine Mining at its Hayden Lake refinery. Sunshine Mining is the only U.S. mining company to mine, refine, and mint gold and silver bullion.

Mineral-related legislation passed in the Idaho legislative session included House bills that clarified different aspects of mineral exploration, such as, when and where exploration certificates need to be filed, definition of certain exploration terms, rental fees, the use of motorized equipment, and when exploration and reclamation plans are needed.

Review by Nonfuel Mineral Commodities. Owing to slumping prices, Bunker Hill Mining Co. laid off about 45 miners, about 20% of the mining staff, at its **zinc-lead-silver** mine near Kellogg. The company said that production would be maintained and only exploration and development curtailed. Bunker Hill had been identifying and developing additional reserves in the downward extension of the high-grade-zinc Quill zone.

Star Phoenix Mining Co. closed the Star lead-zinc mine after Hecla cancelled a lease agreement. Hecla said it took action when several lien claims against the mine were not resolved. Star Phoenix said that because of Hecla's actions, they had to close the mine and lay off their miners. Star Phoenix filed a lawsuit against Hecla.

During the second quarter, Asarco shutdown the Galena mine shaft for repair. With a new circuit for processing silver-lead, Galena now produces both silver-copper and silver-lead concentrates. Other mines producing in the Coeur d'Alene mining district included Sunshine Mining's Sunshine Mine, the Coeur Mine operated by Asarco, and Hecla's Lucky Friday Mine at Mullen. Reportedly, Hecla reduced production in non-lead-zinc areas at the Lucky Friday.

Nerco Minerals Co. produced silver and gold at its DeLamar Mine open-pit near Silver City, Owyhee County. In addition to a vat leach mill, the company operated a heap-leach system for low-grade ores. The company began the permitting process to operate its nearby Stone Cabin Mine. Formerly known as Florida Mountain, the gold-silver project would include three open pits with ore processing via heap leaching and conventional milling.

Idaho Gold Corp., a subsidiary of Bema Gold Corp,. reported better than anticipated gold and silver production at its new Champagne open-pit heap-leach mine 20 miles west of Arco in Butte County. Bema carried out an intensive exploration program on the St. Louis and Poison Gulch zones, one mile from the Champagne pit. The U.S. Bureau of Land Management approved Idaho Gold's plans to operate its new Buffalo Gulch heap-leach mine, near Elk City. In the same area, the company proposed a similar mine at Ericson Reef.

After a one year suspension in order to construct a new plant and heap-leach pad, Hecla resumed production at its Yellow Pine Mine east of McCall. Because of its remote location, the Yellow Pine is operated on a seasonal basis. U.S. Antimony Corp. (USAC) mined at its Specimen gold property near Lowman, Boise County. Output was trucked 85 miles for treatment at the Preacher's Cove mill. USAC started construction on a 250 ton-per-day mine and mill at its Yellowjacket property in Lehmi County. Coeur d'Alene Mines operated its seasonal Thunder Mountain heap-leach gold mine, reportedly its last year of production. The mine's largest orebody, the Sunnyside deposit, was exhausted and the company began production at its nearby Lightning Peak deposit. FMC Gold acquired Meridian Gold Co. and control of the Beartrack gold project. Sited 10 miles west of Salmon and north of the historic placer mining town of Leesburg, the property consists of two lode gold deposits that can be open-pit mined and processed using the latest heap-leach technology. Work focused on feasibility studies and the completion of required permitting.

Pegasus Gold Inc. began a $12 million construction project at its Black Pine gold property in Cassia County. Pegasus acquired the open pit mine from Noranda Gold Co. and indicated that it may contract out the mining.

CoCa Mines Inc. continued work on permitting and development of its Grouse Creek mining project. The proposed open-pit gold-silver mine would include ore from two deposits in the Jordan Creek area in the Yankee Fork of the Salmon River.

Atlanta Gold Co. continued development work on its open-pit gold prospect in Elmore County. The company projects it to be the largest gold operation in the State. If approved by company shareholders, Atlanta Gold reportedly will grant Newmont Exploration the right to earn 51% interest in the project.

Cyprus Minerals Co. produced molybdenum at its Thompson Creek open pit mine near Challis. The first full year of operation for the company's new high-purity, lubricant-grade moly disulfide plant was concluded in 1990.

Phosphate rock was mined by four companies-- Conda Partnership, a joint venture of NuWest Industries Inc. and Western Cooperative Fertilizer Ltd.; Monsanto; J.R. Simplot; and Stauffer, a subsidiary of Rhone-Polenc Co. --in Bingham and Caribou Counties. Elemental phosphorous plants were operated by FMC at Pocatello and Monsanto Co. near Soda Springs.

One of four **garnet** mines in the world, owned by Emerald Creek Garnet Mining Co., is near Fernwood, Benewah County. The garnet produced was milled to varying coarseness for use in water filtration, sand blasting, and polishing.

ILLINOIS

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Annual, Estimated

THE MINERAL INDUSTRY OF ILLINOIS IN 1990

Nonfuel mineral production in Illinois was valued at approximately $661 million in 1990, according to estimates by the U.S. Bureau of Mines. This was an increase of about 4% over the value in 1989 and a record high. An estimated 10% increase ($26 million) in the value of stone sales was the primary reason for the rise. Increases also were recorded for barite, common clay, peat, construction sand and gravel, industrial sand, and zinc. Values declined for the remaining 16 nonfuel minerals produced in the State. The State ranked 17th in the Nation in nonfuel mineral production value. In terms of value, crushed stone was the leading commodity produced, followed, in descending order, by construction sand and gravel, portland cement, and industrial sand.

Table 1 --Nonfuel mineral production in Illinois 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement (portland) thousand short tons --	2,307	$101,760	2,776	$117,224	2,700	$116,100
Clays2/ ---------- metric tons --	183,571	704	142,207	641	821,866	2,561
Fluorspar ---------- do --	W	W	W	W	60,000	W
Gem stones ----------	NA	30	NA	W	NA	W
Sand and gravel:						
Construction --- thousand short tons --	30,098	93,504	e/33,000	e/108,900	33,800	117,300
Industrial ---------- do --	4,328	56,142	4,582	52,935	4,550	54,200
Stone:						
Crushed ---------- do --	e/57,900	e/251,200	3/60,829	3/256,832	3/63,800	3/283,100
Dimension ---------- short tons --	e/1,175	e/129	W	W	W	W
Combined value of barite (1989-90), cement (masonry), clays (fuller's earth), copper (1988-89), lead, lime, peat, silver (1988-89), stone (crushed sandstone, 1989-90), tripoli (1988-89), zinc, and values indicated by symbol W	XX	84,157	XX	96,829	XX	88,090
Total----------	XX	587,626	XX	633,301	XX	661,351

e/Estimated NA Not available W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" data.
3/Excludes certain stones; kind and value included with "Combined value" data.

Employment. Total mining employment averaged 19,900 persons in October 1990, the latest month for which statistics were available. The coal industry accounted for 11,800 of these jobs. The average weekly wage for all mining was $722. Coal mining weekly wages averaged $838. Employment at steel mills averaged 24,900, with average weekly wages of $617.

Legislation and Government Programs. Federal legislation (HR 5428 and S 2948) was introduced in August to set aside about 28,000 acres of the Shawnee National Forest in Southern Illinois as wilderness and included provisions that would protect fluorspar mining in Hardin County. Approximately 90% of all U.S. fluorspar reserves, and the highest quality deposits, are in southern Illinois. Less than 10% of the Nation's requirements for this strategic mineral was supplied from domestic sources in 1989, and the Illinois underground mines of Ozark-Mahoning Co. provided over 98% of the domestic component. Normally, under wilderness designation, mining is prohibited except for companies holding valid prior mineral rights, though no new contracts may be let. Between 1986 and 1989, however, Ozark-Mahoning allowed some of its undeveloped leases to lapse because of financial problems. Ozark-Mahoning officials estimate the life of its present operations to be 10 years, and access to the two most promising of the company's former lease areas could extend that another 10 years. Under provisions of the legislation, 3,000 acres of the forest would temporarily be excluded from wilderness designation, giving Ozark-Mahoning the right to prospect for and mine fluorspar on that acreage for 20 years. At the end of that period, it would automatically revert to wilderness designation. Ozark-Mahoning employs about 150 people in Hardin County.

In early March, the City of Chicago announced that it was considering a southeast side location for a potential new airport. The site could threaten 47 businesses and 6,700 housing units. Businesses affected could include an LTV Steel Co. coke plant and an Acme Steel Co. blast furnace and coke plant. The site is one of four options under consideration, including two suburban locations and an expansion of the regional airport at Gary, IN. Projected cost for construction at the Chicago site is $4.9 billion, with completion in 2010. The new airport would relieve congestion at O'Hare Airport and would be Chicago's third facility.

The State's Abandoned Mined Lands Reclamation Council awarded K.D. Crain & Sons, Johnson City, a contract for $154,000 for reclamation of 12 fluorspar mines in Hardin and Pope Counties. This was the first time a noncoal reclamation project had been undertaken in Illinois. Authority for these noncoal reclamation projects was provided in 1989 under provisions of an amended Abandoned Mined Lands and Water Reclamation Act.

Organic compounds created by chemists at Southern Illinois University--Carbondale have proven successful in removing sulfur from Illinois coal. Total sulfur content has been reduced as much as 50% while preserving 80% to 90% of the coal's original Btu value. The new cleaning method, known as the Meyers-Read process, uses sulfonate compounds mixed into a finely pulverized coal and water slurry containing pyritic sulfur and ash. Air circulated through the mixture causes the coal to rise to the surface. The cleaned coal is then collected. The product can either be pelletized or used in its slurry form by utility companies or other customers.

Review by Nonfuel Mineral Commodities. **Crushed stone** was the leading nonfuel mineral commodity produced in Illinois. It accounted for about 43% of the total nonfuel mineral value. Production was estimated to have been about 64 million tons, a 5% increase over that of 1989. Value increased about 10%, to more than $283 million. Nationally, the State ranked fourth in crushed stone production and accounted for 5% of the Nation's output.

Portland cement shipments and value declined 3% and 1%, respectively, and mirrored a sluggish building and construction industry. Many economists blamed the decline on high interest rates and growing concern over a slowing economy. In December, Lone Star Industries Inc., filed for protection from creditors under Chapter 11 of the U.S. Bankruptcy Code. The company said it was filing for protection because it couldn't meet certain obligations under its agreements with creditors and because it had been hurt by diminishing housing construction starts and greater foreign competition. Lone Star, one of the largest cement companies in the U.S., operates plants in several States, including one in LaSalle County, IL.

In mid-December, Lafarge Corporation, Reston, VA, began transactions to acquire various operations of Cementia Holdings AG of Zurich, Switzerland, including the Joppa, IL, plant of its Missouri Portland Cement Co. subsidiary. Also included in the proposed agreement would be cement manufacturing

plants in Iowa and Missouri, more than 30 related ready-mixed concrete and aggregate operations, and 16 terminals along the Mississippi River and its tributaries. Lafarge reportedly would become the second largest coment producer in the Mississippi River region, with a combined capacity of 3.8 million short tons of cement. The transactions were expected to be completed in January 1991.

Production and value of **construction sand and gravel** increased 2% and 8%, respectively. Illinois maintained its ranking as the Nation's leading **industrial sand** producer, in spite of a slight decline in output. Total value increased about 2%, however, because of higher unit prices. **Lime** production and value each dropped about 5%, reversing an upward trend that began in 1986. **Common clay and shale** production and value increased, whereas output of fuller's earth declined.

About 60,000 metric tons of **fluorspar** was produced in southern Illinois. Sales value increased about 1%. **Lead**, recovered as a byproduct of fluorspar mining, dropped about 96% in quantity and 95% in value. **Zinc**, also recovered as a fluorspar mining byproduct, increased 24% in output and 13% in value.

INDIANA

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Annual, Estimated

THE MINERAL INDUSTRY OF INDIANA IN 1990

Nonfuel mineral production in Indiana during 1990 was valued at about $459 million, according to estimates by the U.S. Bureau of Mines. This was a 6% increase over the record established in 1989 and the eighth consecutive year of growth. With the exception of lime and gem stones, total sales values increased for each of the 12 nonfuel minerals produced. Crushed stone, portland cement, and construction sand and gravel, the leading minerals produced, accounted for 79% of the total value. Nationally, Indiana ranked 25th in nonfuel mineral value supplying about 1% of the Nation's total. Indiana produced more dimension stone and masonry cement than any other State and ranked third in the production of peat. No metallic ores are mined in the State; however, it is the leading producer of pig iron and raw steel and ranks high in aluminum output.

Table 1 --Nonfuel mineral production in Indiana 1/

Mineral	1988		1989		1990e/	
	Quantity	value (thousands)	Quantity	value (thousands)	Quantity	value (thousands)
Cement:						
Masonry ---------- thousand short tons --	405	$27,442	357	$24,054	385	$26,200
Portland ------------------------- do --	2,315	107,179	2,364	108,297	2,500	115,000
Clays ---------------------- metric tons --	1,035,837	4,630	871,179	3,836	e/1,047,664	e/6,215
Gem stones -------------------------------	NA	10	NA	W	NA	W
Peat ------------- thousand short tons --	54	W	34	607	37	690
Sand and gravel:						
Construction ---------------------- do --	25,923	79,985	e/29,600	e/99,200	28,400	100,000
Industrial ------------------------ do --	362	1,829	W	W	W	W
Stone:						
Crushed ------------------------- do --	e/36,600	e/130,000	3/36,188	3/136,252	3/36,600	3/147,700
Dimension ----------------- short tons --	e/195,444	e/24,956	3/198,531	3/27,212	197,373	29,730
Combined value of abrasives (1988-89), clays (kaolin, 1990), gypsum, lime, stone [crushed marl and miscellaneous (1989-90), dimension sandstone, 1989], and values indicated by symbol W ------	XX	30,358	XX	34,657	XX	33,746
Total----------	XX	406,389	XX	434,115	XX	459,281

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Excludes certain stones; kind and value included with "Combined value" figure.

Employment. According to the Indiana Department of Employment and Training Services, employment at Indiana mines and quarries averaged 8,100 persons in September 1990, the latest month for

which statistics are available. The same number of employees were reported for September 1989. Steel mill employment, however, declined 1%, to 37,800 persons. Hourly earnings averaged $15.73 for mining employees and $17.09 for steel mill workers. These figures represented increases of $0.64 per hour and $0.86 per hour, respectively, over September 1989 earnings. Both industries recorded shorter workweeks, with the average number of hours in the mining sector dropping from 47.9 hours in 1989 to 45.5 in 1990; and in steel mills, dropping from 44.6 hours to 41.7.

Environment. In one of the largest settlements, ever, of an environmental lawsuit, USX Corp. agreed in late July to pay an estimated $34.1 million in penalties and cleanup costs for dumping wastewater from its Gary steel mill into the Grand Calumet River. The out-of-court settlement resolved a 1988 lawsuit filed by the U.S. Environmental Protection Agency (EPA) alleging that USX illegally bypassed its blast furnace wastewater treatment system and dumped polluted water from the Gary mill directly into the Grand Calumet and Lake Michigan on several occasions. The plant draws about 350 million gallons of Lake Michigan water daily and discharges about the same amount into the river. About $25 million of the settlement costs will be used to clean up operations at the Gary mill, $2.5 million to study contamination of a 12-mile stretch of the Grand Calumet River, $5 million to clean up contamination of the river, and the remaining $1.6 million as a civil penalty. EPA expects USX to complete the improvements in 2 years, with the company complying with more than 100 requirements and meeting 70 deadlines. USX could face additional penalties, ranging from $750 per day to $17,500 per day, for any missed deadlines. The settlement was a consent decree, with no admissions by USX to any allegations. The Gary Works is the Nation's largest steel mill.

The U.S. Department of Justice filed legal action in October against Inland Steel Industries Inc. of East Chicago and Bethlehem Steel Corp. of Portage for allegedly polluting Lake Michigan. The companies were charged with violating the Clean Water Act, Safe Drinking Water Act, Clean Air Act, and Resource Conservation and Recovery Act. The lawsuit seeks the cleanup of hazardous wastes, air pollutants, and toxic water pollutants. Bethlehem was named for alleged violations at its Burns Harbor plant, south of Lake Michigan and north of the Little Calumet River. Inland was accused of discharging ammonia, grease, and zinc into Indiana Harbor and the Grand Calumet River; both are part of the Lake Michigan watershed. Inland's boilers exceeded sulfur dioxide and nitrogen dioxide air emissions limits, according to the lawsuit. The companies could be fined up to $25,000 per day per violation under each of the four laws.

Late in the year, Inland Steel announced that it would study the possibility of replacing five of the six coke-making facilities at its Indiana Harbor Works steel plant in East Chicago, Porter County, with a technologically advanced process that could significantly cut air and water emissions. The company hopes to complete the study within 2 years, and, if the facility is built, to begin operating in the mid-1990's.

Legislation and Government Programs. All mineral-related measures enacted during 1990 dealt with some aspect of environmental protection. House Enrolled Act 1269 requires an insurer that proposes to issue or renew an insurance policy covering a building in certain Indiana counties to inform the policyholder or prospective policyholder of the availability and cost of mine subsidence coverage. Senate Bill 52 designates the Division of Surface Mine Reclamation as responsible for control of pollution from test holes relating to coal exploration. It also establishes a permit fee of $100 for drilling noncoal test holes of 200 feet or deeper and regulates applications for, and posting of bonds for surface coal mine reclamation. Other enacted legislation included measures related to establishing solid waste management districts and providing technical assistance to small businesses for environmental problem solving.

Review by Nonfuel Mineral Commodities. Production and value of **crushed stone**, the State's leading nonfuel mineral commodity, rose about 1% and 5%, respectively, to record high levels. Nearly one-third of the State's nonfuel mineral value was from crushed stone sales. On January 31, CSR Limited, of Australia, acquired ARC America Corp. whose holdings in Indiana included three quarries and three sand and gravel pits operated by American Aggregates Corp.

Sales of **portland and masonry cement** from the four Indiana plants increased about 6% and 8%,

respectively. The value of portland sales, which was at an alltime high, contributed one-fourth of the State's nonfuel mineral value. Indiana ranked first among 33 masonry-cement-producing States. In December, Lone Star Industries Inc., filed for protection from creditors under Chapter 11 of the U.S. Bankruptcy Code. The company said it was filing for protection because it couldn't meet certain obligations under its agreements with creditors and because it had been hurt by diminishing housing construction starts and greater foreign competition. Lone Star, one of the largest cement companies in the U.S., operates plants in several States, including one at Greencastle in Putnam County, IN.

Although production of **construction sand and gravel** was estimated to have been 4% less than the 1989 output, attendant value increased 1% to a record $100 million. The **industrial sand** sector rebounded somewhat from the sharp decline of 1989 and posted production and value increases of 17% and 88%, respectively.

A steady, strong demand for building stone kept **dimension limestone** production at nearly the same level as in 1989, while value increased over 9% to an alltime high. Indiana again ranked first of the 34 States producing dimension stone.

Lime sales and value at the two Lake County plants fell nearly 11%. A partial reason for the decline may have been the increased use of fluxed taconite pellets at area steel mills, which are the primary consumers of Indiana lime. Less lime is required in the blast furnace process when these "limestone/dolomite-fluxed" pellets are used.

Crude **gypsum** production and value from the two Martin County underground mines increased about 2% and 5%, respectively, to record highs. Indiana ranked third of 21 gypsum-producing States. **Peat** sales and value were about 9% and 14% greater than in 1989 but remained approximately one-half of the previous 10-years' average. Significant increases were also estimated for **clay** production.

Production of cold-rolled sheet steel began on March 19 at the new I/N Tek plant at New Carlisle. The $500 million facility is a joint venture between Inland Steel Co. and Nippon Steel Corp. The plant uses a continuous cold-rolling process originally developed by Nippon Steel at its Hirohata Works in Japan. Processing time is reduced to less than 1 hour from the 12 days necessary for other processes. At full capacity, the plant is designed to produce one million short tons of cold-rolled steel annually and to employ about 230 people. Construction continued on the adjacent $450 million galvanizing mill, I/N Kote, which is scheduled for completion by 1992.

Beta Steel Corp. began construction of a $100 million hot-rolled steel minimill at Burns Harbor in Porter County. The plant, expected to be in operation during the first half of 1991, would process up to 400,000 short tons of steel slabs into less-than-60-inch steel coils annually. Feedstock would be purchased from other area mills. Beta's customers would include steel service centers, and tube and pipe manufacturers that currently import steel. The plant could create as many as 170 new jobs.

Late in the year, Inland Steel Industries, Inc. announced plans to close its structural steel division unit at East Chicago on March 3, 1991, unless market conditions improve. According to company officials, increased competition from low-cost minimills, made it impossible for the company to compete profitably. Reportedly, it costs integrated steel mills $50 to $100 more per ton to produce structural steel than it costs nonunion mini-mills. About 325 people would be affected by the shutdown.

IOWA

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Annual, Estimated

THE MINERAL INDUSTRY OF IOWA IN 1990

The value of Iowa's nonfuel mineral production was about $319 million in 1990, according to estimates by the U.S. Bureau of Mines. This was a 13% increase over that of 1989. Commodities contributing the greatest amounts to the State's nonfuel mineral value were, in descending order, portland cement, crushed stone, construction sand and gravel, and gypsum. Nationally, Iowa ranked 34th in value of nonfuel mineral production. The State ranked second in output of crude gypsum, behind Oklahoma. Nearly all of the mineral production was used in the construction industry. Mining employment in the State for the period September 1989 to September 1990 was up 5% to 2,200 persons. Average weekly earnings for mining jobs in the same period rose $40 to $497. Average hourly wages were $9.78, an increase of $.44.

Table 1 --Nonfuel mineral production in Iowa 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry -------- thousand short tons --	W	W	47	$4,450	60	$5,800
Portland ------------------------ do --	2,029	$98,930	2,072	$102,387	2,700	132,300
Clays ---------------------- metric tons --	403,923	1,588	439,323	1,773	414,628	1,491
Gem stones ------------------------------	NA	W	NA	10	NA	10
Gypsum ---------- thousand short tons --	2,047	13,710	2,273	16,884	2,322	17,763
Peat ------------------------------ do --	15	433	W	W	14	521
Sand and gravel (construction) --- do --	11,880	36,087	e/12,800	e/37,800	11,400	35,300
Stone:						
Crushed ------------------------- do --	e/29,200	e/128,500	28,049	111,182	28,500	118,600
Dimension --------------- short tons --	W	e/588	15,151	613	W	W
Combined value of other industrial minerals and values indicated by symbol W ----------	XX	10,420	XX	7,603	XX	6,940
Total----------	XX	290,256	XX	282,702	XX	318,725

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Legislation and Government Programs. The Federal Office of Surface Mining, in January, awarded the State $500,000 in grants for abandoned mine reclamation projects. Part of the grant will be used for a reseeding project at the Rouwenhorst West reclamation project, site of an abandoned mine near Knoxville. About $334,000 of the money is to be used to defray the cost of administering the State's abandoned mined lands reclamation program.

The Iowa Geological Survey Bureau (IGSB) continued work on its Ground Water Vulnerability Mapping Program. Part of the effort involved continuation of preparing a bedrock topographic map for the

State. This tool, when completed in 1992, will benefit minerals explorationists in addition to ground water researchers. Work also continued on an unconsolidated material thickness map. This project, also expected to be completed in 1992, will be useful to aggregate producers in identifying new sources of crushed stone.

In April, the IGSB published results of the AMOCO Production Company M.D. Escheid No. 1 deep petroleum test done in Carroll County in 1987. The 15,850-foot-deep dry hole was plugged and abandoned but provided information on potential oil source rocks elsewhere in the region.

In February, the State Legislature adopted Senate Resolution 108 which designated September 23rd as American Coal Miners' Memorial Day. The purpose of the commemorative holiday is to educate school children about the dangers of coal mining and the importance of the coal industry.

Review by Nonfuel Mineral Commodities. **Portland cement** contributed about 42% to the State's total nonfuel mineral value. Production and value increased about 30% and 29%, respectively, from 1989 levels. **Masonry cement** sales and value increased about 28% and 30%, respectively. On January 19, Northwestern States Portland Cement Co. stockholders approved the company's acquisition by Dundee Cement Co. Purchase price of the Mason City operation was $44 million. The Mason City cement plant has an annual capacity of 900,000 short tons of portland and masonry cement. Dundee, with headquarters in Dundee, MI, is a subsidiary of Holderbank Financiere Glarus AG of Switzerland.

In mid-December, Lafarge Corporation, Reston, VA, began transactions to acquire various operations of Cementia Holdings AG of Zurich, Switzerland, including the Buffalo, IA, plant of its Davenport Cement Co. subsidiary. Also included in the proposed agreement would be cement manufacturing plants in Illinois and Missouri, more than 30 related ready-mixed concrete and aggregate operations, and 16 terminals along the Mississippi River and its tributaries. Lafarge reportedly would become the second largest coment producer in the Mississippi River region, with a combined capacity of 3.8 million short tons of cement. The transactions were expected to be completed in January 1991.

Crushed stone accounted for 37% of the State's total nonfuel mineral value. Production and value increased about 2% and 7%, respectively, compared with the 1989 figures. In February, Kuhlman Construction Co. of Colesburg received the Iowa Limestone Producers Association's highest safety award--Recognition of Excellence for Outstanding Achievement. The construction aggregate producer's employees worked a total of 20 years without a single lost time accident. The association presented several Quarry Beautification Awards.

Construction sand and gravel contributed about 11% to Iowa's total nonfuel mineral production value. Compared with 1989 figures, production decreased about 11%, and value decreased about 7%.

Gypsum production and value increased about 2% and 5%. The USG Corp. Sperry Mine at Sperry was a runner-up in the underground nonmetals category for the prestigious Sentinels of Safety award. The annual award is presented by the Federal Mine Safety and Health Administration and the American Mining Congress in recognition of safe operations and those with effective accident prevention programs. **Lime** production and value decreased about 11%. Production and value of **clay** decreased about 6% and 16%, respectively. **Peat** production declined slightly compared with that of 1989.

PMX Industries, a subsidiary of Poongsan Corp. of Seoul, South Korea, continued construction of its new copper, brass, and specialty steel mill at Cedar Rapids. In October, the U.S. Congress, as part of an appropriations bill, attached a provision granting the PMX operation Free Trade Zone Status. This status will grant the facility special import benefits, and for the first time, circumvents the zone creation process overseen by the U.S. Commerce Department.

In January, Quanex Corp. announced plans to build an aluminum processing minimill in Davenport. Construction of the new $60 million project is expected to be completed by mid-1992. It will be adjacent to the company's existing Nichols-Homeshield aluminum operations. The Houston, TX, company's new plant will melt aluminum scrap and process it into aluminum sheet.

KANSAS

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Annual, Estimated

THE MINERAL INDUSTRY OF KANSAS IN 1990

The U.S. Bureau of Mines estimated that the value of nonfuel minerals produced in Kansas in 1990 was $366.5 million, a 15% increase over 1989 and the highest total value of nonfuel minerals ever produced in the State. Substantial increases in output of crushed stone, portland cement, construction sand and gravel, and crude helium accounted for the increase. Salt remained the single most valuable nonfuel mineral produced, but its contribution to the new high total value was through a higher unit value rather than larger output. The State ranked 29th in the Nation, producing just over 1% of the total value of nonfuel mineral production. The increase in production of construction sand and gravel, portland cement, and crushed stone in the State can be attributed to increased highway and road construction stemming from the 1989 passage of an 8-year highway enhancement program.

Table 1 --Nonfuel mineral production in Kansas 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry -------- thousand short tons --	50	$2,988	42	$2,514	40	$2,400
Portland ------------------------- do --	1,569	72,805	1,505	69,390	1,700	79,900
Clays2/ ------------------ metric tons --	555,739	2,632	533,099	2,700	527,474	2,634
Gem stones ------------------------------	NA	3	NA	W	NA	W
Salt3/ ---------- thousand short tons --	1,284	55,753	1,948	82,212	1,814	89,159
Sand and gravel:						
Construction --------------------- do.--	10,760	25,329	e/13,000	e/33,200	13,700	36,700
Industrial ----------------------- do --	W	W	230	2,898	300	3,260
Stone:						
Crushed -------------------------- do --	e/17,300	e/72,700	4/15,850	4/56,976	4/20,600	4/79,200
Dimension --------------- short tons --	e/6,889	e/219	W	W	W	W
Combined value of clay (bentonite), gypsum, helium (crude and Grade-A) pumice, salt (brine), stone (crushed sandstone and quartzite, 1989-90), and values indicated by symbol W ----------	XX	59,284	XX	68,449	XX	73,233
Total----------	XX	291,713	XX	318,131	XX	366,486

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Excludes salts in brines; value included with "Combined value" figure.
4/Excludes certain stones; kind and value included with "Combined value" figure.

Employment. Mining employment rose from about 9,500 in November 1989 to about 10,400 in November 1990. Employment in the nonfuels sector was relatively stable at 1,300 workers while

employment in the oil and gas sector increased 11%, substantially exceeding the 2.3% increase in employment for all industries in the State during the year.

Environment. The Kansas Department of Health and Environment (KDHE) planned a 2-year pilot study of the impact of lead, zinc, and cadmium pollution caused by inactive mines in the Galena area, a declared Superfund site. The study, beginning at yearend 1990, was to identify individuals at risk because of their occupation, lifestyle, age, or area in which they live. The Federal Agency for Toxic Substances and Disease Registry awarded KDHE a grant for $387,000 to do the study. The State of Kansas earmarked $600,000 for an alternative water supply for the town of Galena (Cherokee County) and to pay for its share of the cleanup costs. The results of the study will be used for nationwide application to other Superfund sites.

Legislation and Government Programs. Kansas Senate Bill 614 and House Bill 2911, both related to mined land conservation and reclamation for industrial mineral operations, did not get out of committee during the 1990 legislative session. At the present time, only coal is regulated on a statewide basis and other surface mineral producers are not required to reclaim the land.

The Kansas Aggregate Producers met in October to draft initial legislation for a reclamation bill that would cover all industrial mineral operators. The group plans to introduce this measure during the 1991 session. The bill also proposes methods of permitting for new operations. This is in marked contrast to the present system whereby permits are generally granted by respective county commissioners.

Review by Nonfuel Mineral Commodities. Rock **salt** is the leading nonfuel mineral produced in Kansas in terms of value, comprising nearly one-quarter of the total value of nonfuel minerals produced. Output is estimated to have declined 8.5% in 1990, but the value of that output increased 7%.

The Justice Department filed an antitrust suit against North American Salt Co. (at Mission) which owned both the former Carey (at Hutchinson) and American (at Lyons) rock salt mines. While no objection had been raised to North American retaining ownership of the evaporative salt operations, the company would be required to divest itself of the rock salt mines.

Portland cement and crushed stone followed rock salt in total value of output. The quantity and value of portland **cement** increased 13% and 15%, respectively, over 1989 values.

In September, Lone Star Industries Inc. announced it would stop mining activity and cement production at its Bonner Springs plant. By yearend, the company expected to lay off about 100 workers and retain only a few employees to operate the planned storage facility for wholesale cement sales. In December, Lone Star filed for reorganization under Chapter 11 of the Federal Bankruptcy Act and planned to sell its marginal cement operations, including the plant at Bonner Springs. The parent company said a combination of subsidized imports plus a downturn in the construction industry were the major reasons for the reorganization, a route the company elected to follow despite two offers from foreign investors.

Crushed stone output and value were estimated to have increased sharply, 30% and 39%, respectively, making this commodity the best nonfuel mineral performer during the year.

The production of crude **helium** rose substantially in 1990 after several years of declining output. Kansas output was by far the larger of the two States reporting crude helium production, the other State being Texas. The price of crude helium remained at $22 per million cubic feet. Refined helium output and price remained constant, the latter at $37 per million cubic feet. Kansas continued to lead Wyoming and Texas in output of Grade-A helium.

Construction sand and gravel output increased 5% while value increased 10% relative to 1989. **Industrial sand** output and value showed significant increases of 30% and 21%, respectively. The average price per ton of industrial sand declined from $11.70 in 1989 to $10.87 in 1990.

Clay production consisted of common clay or shale, used for brick and sewer pipe products, and bentonite. While the production and value for common clay was estimated to be nearly identical to 1989 values, the output and value of bentonite increased over 100% from 1989 to 1990.

Crude gypsum output and value remained near 1989 levels, increasing only 2% and 5%, respectively.

Other nonfuel mineral commodities such as pumicite (volcanic ash), salt brine, and crushed sandstone and quartzite showed little change in output or value in 1990.

KENTUCKY

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Annual, Estimated

THE MINERAL INDUSTRY OF KENTUCKY IN 1990

The value of nonfuel mineral production in Kentucky in 1990 was $334 million, according to estimated data compiled by the U.S. Bureau of Mines. Output of the State's major mineral commodities remained about the same as in 1989, indicative of the generally stable conditions in the State's mining industry.

Production of crushed stone declined slightly to 44 million short tons, but that total was the third highest amount reported in the last 10 years. Kentucky remained the Nation's second leading producer of coal with output in excess of 160 million tons.

Table 1.--Nonfuel mineral production in Kentucky 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- metric tons --	762,324	$3,217	716,990	$3,357	1,038,685	$2,887
Gem stones ----------	NA	3	NA	W	NA	W
Sand and gravel (construction) thousand short tons --	6,325	15,243	e/5,500	e/13,100	6,100	17,600
Stone (crushed) ---------- do --	e/50,700	e/207,900	3/48,178	3/187,849	44,400	182,900
Zinc4/ ---------- metric tons --	W	W	--	--	--	--
Combined value of cement, clays (ball clay, fire clay), lime, sand and gravel (industrial, 1989-90), stone (crushed dolomite, 1989-90), and values indicated by symbol W ----------	XX	118,616	XX	124,353	XX	130,592
Total----------	XX	344,979	XX	330,659	XX	333,979

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Excludes certain stones; kind and value included with "Combined value" figure.
4/Recoverable content of ores, etc.

Legislation and Government Programs. The Kentucky Revenue Cabinet began sending assessment notices for *ad valorem* taxation of unmined coal reserves in Kentucky. The Cabinet determined the following basic valuations: In eastern Kentucky, a base value of 18 cents per ton for unmined coal; 22 cents per ton if the coal is in a permitted tract; and 36 cents per ton if it is part of an active mining operation. In western Kentucky, a base value of 8 cents per ton; 10 cents per ton if permitted; and 16 cents per ton if part of an active mining operation. The assessments were expected to be adjusted as additional information was collected and analyzed by the Revenue Cabinet.

Enactment of Federal clean air legislation prompted the Kentucky Geological Survey to study the market for industrial minerals used to control sulfur dioxide emissions in the State. Output of lime, limestone, and dolomite was expected to increase in response to demand created by the legislation.

Review By Nonfuel Mineral Commodities. **Crushed stone** was the leading nonfuel mineral produced in Kentucky. In 1990, a number of independent family-owned stone operations were sold to major corporations. The sale of Reed Crushed Stone Co. to Vulcan Materials Co. was completed. With that purchase, Vulcan Materials, the Nation's leading producer of mineral aggregates, became the owner of the top-producing quarry in the country. Rogers Group Inc., one of the Nation's top 10 crushed stone-producing companies, purchased two quarries in Jefferson County. Rogers Group had operated four quarries in Kentucky and was the State's fifth leading producer of stone before purchasing the quarries from Billy Holloway Aggregates Co.

Also during the year, Kentucky's seventh leading crushed stone producer, Lexington Quarry Co., was purchased by a partnership of Allen Co. Inc. and Sterling Enterprises Inc. Lexington Quarry produced limestone at an underground mine in Jessamine County. Nally & Haydon Inc. bought Ward & Montgomery Co.'s quarry in Lebanon, Metcalfe County.

Other developments in 1990 included the beginning of the construction of a $272 million **steel** processing plant in Carroll County by North American Stainless, a joint venture of Armco Inc. and Acerinox SA of Madrid, Spain. The plant was expected to have an annual capacity of 170,000 tons of chrome-nickel stainless steel when completed in 1992. Newport Steel Corp. and Armco Steel Co., two of Kentucky's steelmakers, each completed construction of a continuous slab caster.

One of Kentucky's two primary **aluminum** smelters, National Southwire Aluminum Co., a partnership of Southwire Co. and National Aluminum Corp., was bought by Southwire Co.

LOUISIANA

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Annual, Estimated

THE MINERAL INDUSTRY OF LOUISIANA IN 1990

The 1990 nonfuel mineral value estimated by the U.S. Bureau of Mines, for Louisiana was $383 million. This was $3 million above the figure reported in 1989. An increase, over $20 million, in the sales of gypsum, salt, and sand and gravel production offset a $19 million decline in clays, lime, crushed stone, and sulfur. The State continued to rank first in the production of salt and second in sulfur output. Nationally, Louisiana ranked 28th in nonfuel mineral value.

During the year, the State banned shell dredging in Lake Pontchartrain, and highway projects were delayed as contractors scrambled to obtain shell from Gulf of Mexico dredgers. The State issued multiple permits to a Texas firm to develop a salt dome for hydrocarbon storage.

Work continued on enlarging Kronos Louisiana Inc.'s titanium dioxide plant at Westlake. A New Orleans architect-engineering firm designed a mile-long platform city to be installed in 210-foot deep water 17 miles off the Louisiana coast. The city will house workers recovering sulfur by the Frasch process.

Table 1 --Nonfuel mineral production in Louisiana 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	340,900	$9,535	233,992	$6,115	378,280	$5,275
Gem stones ----------	NA	3	NA	14	NA	14
Salt ---------- thousand short tons --	14,274	108,982	13,218	115,203	13,925	122,309
Sand and gravel:						
Construction ---------- do --	14,233	52,820	e/13,600	e/54,400	15,900	66,800
Industrial ---------- do --	318	4,786	572	9,664	610	10,760
Stone (crushed) ---------- do --	e/ 2/3,700	e/ 2/29,200	3,206	24,414	2,100	16,800
Sulfur (Frasch) thousand metric tons --	1,719	W	1,334	W	1,360	W
Combined value of cement [masonry (1988), portland, (1988)], gypsum, lime, stone [crushed miscellaneous (1988)], and values indicated by symbol W ----------	XX	229,210	XX	189,912	XX	159,147
Total----------	XX	434,536	XX	379,722	XX	381,105

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain stones; kind and value included with "Combined value" figure.

Environment. The multi-year controversy over environmental damage to Lake Pontchartrain by shell dredging came to a head in 1990. The State banned dredging. After a court battle, dredging was

allowed to continue, but at a higher royalty rate. Within a week, the Governor premanently banned dredging as environmentally unacceptable.

Output by three synthetic aggregate producers helped to fill the void left by a shell shortage, although environmental controversy was noted over the chemical stability of two of the aggregates.

A number of Louisiana companies that process industrial minerals used deep-well injection to dispose of hazardous waste. The Resources Conversion and Recovery Act banned deep-well injection unless alternative disposal methods were unavailable. Ten companies were seeking exemption from the law.

Despite environmentalists' protests, the State Department of Natural Resources Office of Conservation granted Texas Brine Corp. nine permits for wells into the Starks Salt Dome. The permits were issued to drill brine solution mining wells into the body of the dome to develop a cavity for light hydrocarbon storage. Opponents feared the contamination of the Chicot Aquifer that supplies drinking water for southwest Louisiana and southeast Texas. Concerns were also voiced over the earthquake potential of the area.

Legislation and Government Programs. The U.S. Corps of Engineers let contracts to improve 83 miles of levies in Plaquemines Parish. The project, to provide protection from hurricane tidal overflow, will require almost 30,000 tons of riprap as wave berm.

Review by Nonfuel Mineral Commodities. Sulfur continued as the primary mineral commodity, interm of value, produced in the State. **Salt** ranked second, followed by **construction sand and gravel, crushed stone,** and **clay.**

A New Orleans architect-engineering firm was the primary contractor for a mile-long "city" designed to house 146 **sulfur**-petroleum recovery employees. The "city", to be situated 17 miles offshore in the Gulf of Mexico in 210 feet of water, will cost $550 million.

Work continued on the two largest structures at Kronos Louisiana Inc.'s Westlake **titanium dioxide** complex. The new facility will increase the plant's output capacity from 360,000 to 450,000 short tons per year and raise the company's percentage at the world market for titanium dioxide from 11% to 13%.

MAINE

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Annual, Estimated

THE MINERAL INDUSTRY OF MAINE IN 1990

The value of nonfuel mineral production in Maine in 1990 was estimated by the U.S. Bureau of Mines to be $56 million. This value represents a decrease of 13% from that of 1989, primarily the result of lower sales of construction sand and gravel, the State's leading mineral commodity in terms of value. Other commodities produced included crushed and dimension stone, cement, common clay, gem stones, and peat.

Construction aggregates have accounted for virtually all of the State's mineral production since 1977 when the State's last metal mine closed. In October 1977, Kerramerican Inc., the State's last metal producer, ceased copper mining operations at its Blue Hill Mine in Hancock County. However, over the past decade, many mining companies have been exploring throughout the State, primarily for massive sulfide-based deposits. At least three companies have announced a desire to obtain the environmental permits necessary to place three deposits into production. As a result of this renewed interest in metal mining in the State, new legislation to rewrite the State's mining regulations was signed into law in 1990. The present rules were not written with mining in mind and would effectively preclude any metallic metal mining activities in Maine.

Table 1 --Nonfuel mineral production in Maine 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$150	NA	W	NA	W
Sand and gravel (construction) thousand short tons	10,183	33,007	e/8,600	e/$30,100	6,200	$22,100
Stone:						
Crushed do	e/1,400	e/5,300	1,591	8,801	1,500	8,700
Dimension short tons	e/7,512	e/5,924	W	W	W	W
Combined value of cement, clays (common), garnet (abrasive 1988), peat, and values indicated by symbol W	XX	23,379	XX	25,753	XX	25,243
Total	XX	67,760	XX	64,654	XX	56,043

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Exploration. At least three companies are continuing exploration and baseline studies on metallic deposits in the State. Boliden International Mining AB continued to evaluate a massive copper-zinc sulfide deposit near Carr Pond, Aroostook County. BHP-Utah continued evaluating a zinc and copper

deposit near Alder Pond, Somerset County, and Black Hawk Mining Ltd. was in the early stages of planning for permit acquisition for a nickel-copper-cobalt deposit near Warren. Horizon Gold Shares Inc., which recently acquired Mt. Chase's massive sulfide deposit near Patten, had not announced any plans.

In response to Black Hawk Mining's proposal to mine a 26-acre nickel-copper-cobalt deposit near Warren and Union, the town manager of Warren recommended that townspeople adopt a 6-month moratorium on metal mining. The moratorium, which could be extended an additional 6 months with a town vote, would give the town up to 1 year to explore all its options and draft a meaningful ordinance.

Environment. The Maine Low Level Radioactive Waste Authority (MLLRWA) gave the go-ahead to examine about half of Maine Yankee nuclear powerplant's 740-acre site in Wiscasset for a possible low-level radioactive waste site. The nuclear powerplant was the first "volunteer" to offer its compound as a disposal site for the State's low-level radioactive waste. The majority of the radioactive waste in the State is generated by Maine Yankee. The MLLRWA is also considering a site in Aroostook County. In September, the Maple Mountain Manganese Co. offered its 500-acre site west of Bridgewater in Aroostook County as another possible disposal site. The company purchased Maple Mountain in 1987 to mine manganese, but after feasibility studies indicated that mining was neither possible nor profitable, offered the site to the waste authority. The MLLWRA must find a low-level radioactive waste disposal site in Maine in the event the State is unable to negotiate a contract with an out-of-State disposal facility.

Legislation and Government Programs. Legislation to rewrite Maine's mining regulations (Public Law 874) was signed into law in April. The bill provided for the costs of developing Maine's mining regulations and assurance that regulations would be in place shortly after passage. P.L. 874 also established a tax on mining industry participants. Applicants wanting to conduct mining operations in the State must pay an upfront processing fee of $90,000 plus an annual license fee of $8,000. The processing and licensing fees are expected to establish a pool to pay for development of the regulations. After the bill's passage, Maine's environmental agencies contracted with Lehmann & Associates to rewrite the mining laws. This rulemaking process is expected to be completed by February 1991 and will be watched closely by the exploration and mining companies.

Review By Nonfuel Mineral Commodities. Dragon Cement, New England's only **cement** plant, submitted a proposal to the Wiscasset planning board to build a railroad-to-barge transfer station at the city's waterfront. The company plans to ship the cement by rail to the terminal from its Thomaston plant and then barge the cement to Boston and New Hampshire. Although the proposal received unanimous approval by the town planning board, construction of the transfer station is contingent on a number of conditions. These conditions include meeting Department of Environmental Protection standards for dust emission, monitoring noise levels, alerting lobstermen of barge traffic schedules and that there be no stockpiles of materials at the station.

Morin Brick Co., the State's only producer of **clay**, received State Department of Environmental Protection approval to mine clay on a 89-acre parcel of land near Auburn. Along with the approval came seven pages of stipulations matters such as traffic movement, air quality, storm water runoff, buffer strips, and noise. The area to be mined is adjacent to the areas currently being worked by the company.

In response to citizens' complaints concerning blasting at a **crushed stone** quarry in Topsham, the township enacted a blasting ordinance. The ordinance, the first of its kind in Maine, set limits for ground vibration and shock waves from blasting in quarries at construction sites and in other areas where explosives are used. Town officials used ordinances developed in Huntsville, AL, to write the ordinance, which requires blasters to get town permits and notify nearby residents of expected blasts. The ordinance also requires testing of nearby wells following blasts and seismographic recordkeeping.

MARYLAND

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Annual, Estimated

THE MINERAL INDUSTRY OF MARYLAND IN 1990

The value of nonfuel mineral production in Maryland in 1990 increased to about $354 million according to estimated data compiled by the U.S. Bureau of Mines. Demand for crushed stone and sand and gravel by the construction industry remained strong and accounted for the increase in value over that of the previous year.

Table 1 --Nonfuel mineral production in Maryland 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement (portland) thousand short tons --	1,808	$89,083	1,871	$94,002	1,800	$91,800
Clays ---------- metric tons --	357,833	2,016	351,464	1,882	281,576	865
Gem stones ----------	NA	5	NA	3	NA	3
Lime ---------- thousand short tons --	6	329	--	--	--	--
Peat ---------- do --	7	W	3	W	W	90
Sand and gravel (construction) --- do --	19,266	95,169	e/16,900	e/84,500	17,100	89,800
Stone						
Crushed ---------- do --	e/32,700	e/167,000	30,841	153,375	31,400	163,900
Dimension ---------- short tons --	e/20,729	e/1,515	27,529	2,072	24,102	1,751
Combined value of other industrial minerals and values indicated by symbol W ----------	XX	7,804	XX	6,216	XX	5,625
Total----------	XX	362,921	XX	342,050	XX	353,834

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Legislation and Government Programs. As the decade of the 1990's began, two trends that started in the 1980's continued. Maryland's population increased by about 525,000 during the last 10 years to nearly 4.8 million in 1990. During that same period, the State's output of mineral aggregates--crushed stone and sand and gravel--increased by about 67% and averaged 50 million tons annually from 1987 through 1989. Production of mineral aggregates in 1990 totaled 48.5 million tons.

The growth in population and production of minerals has resulted in a difficult situation for State and local government officials. Citizens living near pits and quarries demanded legislation to restrict or stop mining in their communities. However, the demand for mineral aggregates used in construction of homes, buildings, and highways to support the growing population also increased.

In 1990, State and local legislation was proposed to increase regulation of the mining industry. In the State General Assembly, House bill 1430 was proposed requiring public information meetings and hearings to be conducted by the Department of Natural Resources on all completed applications for a

surface mining permit. This bill was held over for the 1991 legislative session. In April, Anne Arundel County Council imposed a ban on applications for "special exceptions" for mining operations. The ban prevented the opening or expanding of sand and gravel operations until 1991 when new regulations were expected to be adopted.

Review By Nonfuel Mineral Commodities. **Portland cement, construction sand and gravel, and crushed stone** accounted for $345 million, or nearly 98% of Maryland's nonfuel mineral production. Land use issues involving the questions of mine development versus conservation continued to be a major concern of the industries producing these mineral commodities.

Other industrial minerals produced in Maryland included **masonry cement, clays, lime, peat, dimension stone, and industrial sand.** For the most part, these industries were small, long-established, and stable operations; for these commodities, land use conflicts were less significant.

In 1990, Lehigh Portland Cement Co. received approval to open a new limestone quarry near New Windsor for use in **cement** manufacture at its Union Bridge plant. The State's Department of Natural Resources, Water Resources Administration, approved the permit.

In other developments, Bethlehem Steel Corp. began a $300 million modernization program at its Sparrows Point plant. Installation of a 260,000-ton-per-year, galvanized **steel** sheet line was the major part of the program.

MASSACHUSETTS

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Annual, Estimated

THE MINERAL INDUSTRY OF MASSACHUSETTS IN 1990

The value of nonfuel mineral production in Massachusetts in 1990 was estimated by the U.S. Bureau of Mines to be $111 million. This value represents a decrease of $33 million from that of 1989 and primarily the result of lower sales of construction sand and gravel and crushed stone, the State's two leading mineral commodities. Other commodities produced included common clay, dimension stone, industrial sand, lime, and peat. Nationally, Massachusetts ranked 41st in the production of nonfuel minerals. It ranked seventh of 34 States that produced dimension stone, used primarily for curbing.

One of the major causes of lower aggregate sales was the continuing depressed real estate market. Overbuilding in the 1980's had led to a collapse of the residential, commercial, and industrial markets. Also, because of State budgetary cuts, highway construction, which relies heavily on aggregates, was also cut or put on hold during the year. However, the long-term outlook appears brighter for aggregate producers, once the $10 billion Boston Harbor Cleanup and the Boston Central Artery Projects get into full swing. Also, because the State passed an additional 10-cent-per-gallon gasoline tax in the spring of 1990, additional monies should become available for highway projects.

Table 1 --Nonfuel mineral production in Massachusetts 1/

Mineral	1988		1989		1990e/	
	Quantity	value (thousands)	Quantity	value (thousands)	Quantity	value (thousands)
Gem stones	NA	$1	NA	$3	NA	$3
Sand and gravel:						
Construction --- thousand short tons	22,168	79,364	e/13,900	e/57,000	9,200	38,200
Industrial ---------- do.	W	W	34	601	30	495
Stone:						
Crushed ---------- do.	e/17,500	e/91,900	11,880	67,768	9,100	54,500
Dimension ---------- short tons	W	W	67,533	10,302	56,254	10,992
Combined value of clays (common), lime, peat, and values indicated by symbol W	XX	20,973	XX	8,452	XX	7,121
Total	XX	192,238	XX	144,126	XX	111,311

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Environment. Patriot Energy Corp. put on hold its plans to build a $465 million coal-fueled cogeneration electric plant in Ayers as it "reviews the status" of the project, according to the company's project manager. The two partners in the project, Dominion Energy of Richmond, VA, and FHN Energy

of Ohio, are studying the costs and implications of proceeding with the coal plant. The plant has elicited fierce opposition from State and local officials, in addition to a number of residents in Littleton and Ayer who would live near the plant. Earlier in the year, the State Energy Facilities Siting Council approved Patriot's initial environmental impact statement, but called on the company to describe in more detail and wider scope the environmental issues opponents have found most objectionable.

Legislation and Government Programs. Engineers at the University of Massachusetts are planning to construct a large-scale, clay-based solar energy system near the school's Amherst campus. The technique, which could overcome the difficulty of storing solar energy, was explored by the U.S. Department of Energy in the 1970's as a way to heat homes, but heat leaked out of the relatively small system too fast. The Amherst system's much larger, 100,000-cubic-meter clay deposit is expected to retain and give back 85% of its stored heat. As planned, heat from the sun will be captured during the summer utilizing 6 acres of solar collectors. The heated water would then be pumped through underground pipes that lace the clay. In the winter, the warm clay would heat water pumped into the system to 140° Fahrenheit. The heated water would then be pumped to a new convention center on the campus, providing 80% of the center's heating requirements. The estimated cost of the project is $3.5 million.

Review By Nonfuel Mineral Commodities. Boston Sand & Gravel Co. was awarded a 10-year contract by the Massachusetts Water Resources Authority to supply the **concrete** for the massive $4 billion Boston Harbor project. The provisions in the $87.8 million contract state that Boston Sand & Gravel transport by barge all raw materials to a Deer Island central mixing facility it will build and unload them there. The contract also requires that the company have access to, or own, an onshore location to load barges and store materials. Some 913,000 cubic yards of concrete are expected to be used for the Boston Harbor project, which includes building the second largest primary and secondary wastewater treatment facility in the Nation; a nearly 6-mile-long, 11-foot-diameter, deep-rock tunnel from Nut Island to Deer Island under the harbor; and a 9.5-mile, 24-foot-diameter tunnel from Deer Island to a terminal station.

Pfizer, Inc. announced that it would begin a multi-million-dollar expansion of its **lime** plant in Adams. The company said it expects to spend $4- to $6-million per year over the next 10 years to upgrade the facility and to meet environmental concerns. Upgrading would include removing existing inadequate structures and constructing a new office building and a main quality-control-assurance laboratory, which will house a totally computerized control system, according to company officials. Obsolete equipment at the plant reportedly will be replaced and a new carbonator will be built. Pfizer reports that the new equipment will enable the Adams plant to double its production of precipitated calcium carbonate, a high-grade, synthetic product used primarily by the paper industry. Environmental concerns that will be addressed, according to Pfizer officials, include restoration of mined-out land, noise, and dust reduction, and an asbestos abatement program at the plant. Limestone and lime products made at the Adams plant are used in a variety of projects including floor and ceiling tiles, animal feed, scouring cleansers, glazing compounds, paint, cigarette papers, and packaging for food products.

Vitrifix of North America, Inc., Alexandria, VA, was seeking approval to open a plant near Grafton to vitrify **asbestos** into glass. If approved, the plant, which would be the first of its kind in the world, will convert asbestos and glass waste into a hard, reportedly nonhazardous glass product, using a 2,200° Fahrenheit furnace. Carcinogenic asbestos fibers are reportedly destroyed at 1,700° Fahrenheit. In addition to receiving local approval for construction of the plant, the company must also submit an environmental notification form with the Massachusetts Environmental Policy Act (MEPA) unit.

MICHIGAN

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Annual, Estimated

THE MINERAL INDUSTRY OF MICHIGAN IN 1990

The value of Michigan's nonfuel mineral production was about $1.4 billion in 1990, according to estimates by the U.S. Bureau of Mines. The 15% decline resulted mainly from a 17-week strike at the State's two taconite operations in Marquette County. The 36% drop in value of iron ore shipments offset value increases estimated for the sales of portland and masonry cement, copper, gypsum, magnesium compounds, potassium salt, construction sand and gravel, and crushed stone. Leading commodities produced, in decreasing order of value, included iron ore, portland cement, construction sand and gravel, magnesium compounds, and crushed stone. Nationally, Michigan ranked eighth in value of nonfuel mineral production. It was the Nation's leading producer of crude iron oxide pigments, magnesium compounds, and peat. It ranked second in iron ore and industrial sand production, and third in gypsum and construction sand and gravel.

Table 1 --Nonfuel mineral production in Michigan 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry -------- thousand short tons --	265	$22,915	255	$22,286	290	$25,400
Portland ------------------------ do --	5,253	231,141	5,449	253,324	5,500	258,500
Clays ---------- metric tons --	1,248,121	4,432	1,249,198	4,599	1,206,884	4,170
Gem stones ----------	NA	25	NA	10	NA	10
Gypsum ---------- thousand short tons --	1,958	11,630	2,089	15,589	2,133	16,392
Iron ore ------- thousand metric tons --	14,623	W	15,045	W	9,548	W
Lime ---------- thousand short tons --	714	36,088	621	32,479	585	30,596
Peat ---------- do --	322	6,256	286	6,082	290	5,528
Sand and gravel:						
Construction ---------- do --	53,508	138,171	e/48,000	e/132,000	52,800	152,600
Industrial ---------- do --	3,045	27,150	2,865	24,577	2,800	24,020
Stone (crushed) ---------- do --	e/38,800	e/120,300	40,905	123,678	40,700	129,000
Combined value of bromine (1988, 1990), calcium chloride (natural, 1988-89), copper, gold (1988-89), iron oxide pigments (crude), magnesium compounds, potash (1989-90), salt, silver, stone (dimension), and values indicated by symbol W ----------	XX	989,453	XX	984,347	XX	720,211
Total----------	XX	1,587,561	XX	1,598,971	XX	1,366,427

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Employment. Mining employment totaled 8,500 persons in October 1990, the latest month for which statistics were available. This was 1,500 persons less than during October 1989. The main reason for

the marked decrease was the strike which lasted from August 1 to early December at Upper Peninsula (UP) iron ore operations. Mining employment in the UP averaged only 1,700 persons in October 1990 compared with 3,700 in October 1989.

Exploration. Great Lakes Minerals launched a $1 million exploration and development drilling program on a copper deposit in Keweenaw County near Gratiot Lake. The project is a joint venture with Michigan Mining and Manufacturing. Previous drilling has reportedly identified a 3-million-short-ton deposit grading 2.9% copper. Crystal Explorations Inc. continued exploration for diamond-bearing kimberlite pipes in the vicinity of Iron Mountain and Crystal Falls in Iron and Dickinson Counties, respectively. Crystal acquired mineral leases and exploration data from Dow chemical Co., which had explored the area since 1984.

Legislation and Government Programs. In late August, the U.S. Environmental Protection Agency released preliminary results of studies done on the Torch Lake Superfund site. The report indicated there was no ground water contamination in private wells around the town of Lake Linden. Torch Lake was included on the Superfund list in 1986 because some researchers in the early 1980's reported unusually large numbers of fish with abnormal tumorous growths. Some researchers blamed the copper industry for elevated levels of arsenic, chromium, copper, nickel, zinc, and, occasionally, lead. Other researchers countered that all of these elements are naturally occurring. Several follow-up studies failed to conclusively prove a link between the fish abnormalities and copper mining wastes dumped into the lake and the Keweenaw Waterway. The area in question is in Michigan's prolific native copper mining region. For about 125 years, the lake was the site of mining, milling, and smelting operations and was used for mining materials transport and as a depository for mining and milling wastes. Cleanup costs for Torch Lake and the Keweenaw Waterway could reach $1 billion, according to preliminary estimates, potentially making this the most costly project in Superfund history. EPA is trying to define the scope of the problem and to develop a work plan. Following this, EPA will begin a feasibility study to determine various alternatives, including full remediation, partial remediation, or none.

Review by Nonfuel Mineral Commodities. Shipments of **iron ore**, the State's leading mineral commodity in terms of value, were estimated to have decreased about 37%. The decrease is attributed to a 17-week strike. About 1,800 members of the United Steel Workers Union walked off their jobs at Cleveland-Cliffs Iron Co.'s Empire and Tilden Mines on August 1. These were the State's only operating iron ore mines, and they provided about one-fourth of the iron ore shipped from U.S. mines in 1989. In 1990, they supplied about 18% of the U.S. total. The new contract will increase wages $1.25 per hour, with an additional $.25 per hour on January 1, 1992. Also included were a $2,000 signing bonus in 1990, three annual cost-of-living supplements, and 50 shares of Cleveland-Cliffs common stock.

Shipments of **portland cement** increased about 1%, and value increased about 2% in 1990. **Masonry cement** production and value both increased 14%. In March, Dundee Cement Co. merged its operations with Ideal Basic Industries of Denver and St. Lawrence Cement Co. and began operating under the name Holnam Inc., a publicly traded holding company. Holnam is a subsidiary of Holderbank Financiere Glaris Ltd. of Switzerland

Construction sand and gravel were estimated to have increased in production and value about 10% and 16%, respectively. On January 31, CSR Limited, of Australia, acquired ARC America Corp. whose holdings in Michigan included the eight sand and gravel operations of American Aggregates Corp. In 1988, American Aggregates was the State's largest sand and gravel producer. **Magnesium compounds** increased approximately 21% in both production and value. **Crushed stone** was estimated to have increased 4% in value, while output was unchanged.

Copper production increased about 6%, and value about 1%. Early in the year, Metall Mining Co. announced plans to nearly double the annual copper production at its Copper Range Mine to 65,000 short tons. Plans include an expenditure of about $30 million over the next 3 or 4 years to replace antiquated equipment with larger, more efficient machinery. The old equipment has been offered to museums. In May, the company purchased idled milling equipment for its concentrator from Round Mountain Gold Corp. for $4 million. The new milling equipment was expected to boost Copper Range's capacity by 6,000 tons per day to a total of 23,000.

In September, Peninsula Copper Industries (PCI) announced its purchase by Chemetals Inc., a wholly owned subsidiary of Sadachem S.A., a Belgian company. The sale was contingent on completion of rehabilitation and startup of the Centennial No. 6 copper mine, which was last operated in 1968. The mine is to supply PCI with 5 million pounds of copper over a 5-year period. The dewatering phase of the rehabilitation was completed in late summer, and full production is expected by March 1991. The mine is operated by MICHCAN Inc. a joint venture of PCI, Keweenaw Copper Co., and Torch Lake Holdings Co., who acquired the mine in 1989.

In late March, National Steel Corp. began operating a new vacuum degasser at its Great Lakes Division steel mill at Ecorse. The $70-million project is a quality-enhancing process that produces low carbon steel for the auto industry. The vacuum degasser extracts carbon and oxygen from molten steel by injecting inert gases such as argon or nitrogen into the steel under pressure. The low carbon steel is reportedly stronger at a thinner gauge, thereby providing stronger and lighter weight auto body outer panels. Annual production capacity is expected to be about 2 million short tons.

In early November, National Steel Corp. announced plans to build a new coke oven battery at its Great Lakes Division. The 85-oven battery would be completed by 1992 at a cost of $300 million. Coke, a byproduct of coal burning, is used to fuel steelmaking blast furnaces. In June, National Intergroup Inc. sold an additional 20% of its share in National Steel to NKK Corp. of Japan for $146.6 million. The transaction results in NKK owning 70% of National Steel.

MINNESOTA

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Annual, Estimated

THE MINERAL INDUSTRY OF MINNESOTA IN 1990

Minnesota's nonfuel mineral production value was $1.5 billion in 1990, according to estimates by the U.S. Bureau of Mines. This was an increase of nearly 5% over 1989's value. The increase is attributed to gains in output of iron ore, construction sand and gravel, dimension stone, and crushed stone. Minnesota ranked sixth nationally in nonfuel mineral value, up from seventh in 1989. The State was the Nation's leader in iron ore production.

Table 1 --Nonfuel mineral production in Minnesota 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$40	NA	$42	NA	$42
Iron ore ------- thousand metric tons	40,735	1,134,539	41,044	1,285,807	42,887	1,341,231
Peat ---------- thousand short tons	29	1,414	27	1,415	32	1,660
Sand and gravel (construction) --- do	33,769	72,678	e/33,700	e/82,600	34,800	89,400
Stone:						
Crushed ---------- do	e/8,300	e/28,200	8,760	30,218	8,800	31,900
Dimension ---------- short tons	e/45,000	e/13,000	44,605	16,031	60,195	20,836
Combined value of clays (common kaolin), lime, and sand and gravel (industrial) ----------	XX	18,015	XX	22,022	XX	21,960
Total----------	XX	1,267,886	XX	1,438,135	XX	1,507,029

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Exploration. The Minnesota Department of Natural Resources (DNR) held two lease sales in 1990, one in April and the other in October. In previous years, the DNR has had only one sale. Both lease sales saw interest by mining companies weaken, drawing a total of 20 bids by 5 companies. In 1989, 83 bids were received from 10 companies, and in 1988, 504 bids were received from 31 companies. Bidders in 1990 were American Shield Co. with three bids, Chippewa Joint Venture, a partnership between American Shield and Giants Range Minerals Inc., with seven bids, Newmont Exploration Ltd. with three bids, Normin Mining Co., a subsidiary of Boise Cascade Corp., with three bids, and Rhude & Fryberger Inc. with four bids. Of 1.3 million acres listed for the lease sales, only about 10,000 acres were bid on.

In February, BHP-Utah International Inc. drilled one 580-foot hole for gold on ice-covered Shagawa Lake near Ely. The company received a St. Louis County permit in 1989 to drill up to 60 holes. Drilling on the lake was completed in early March, but results were not disclosed. The target area was held by BHP-Utah under a sublease agreement with Kerr-McGee Corp.

In May, International Platinum Corp. announced it had discovered an occurrence of platinum and palladium, near Birch Lake northeast of Babbitt, at a depth of 2,400 feet. Copper, nickel, and gold also

were reported to have been found in the two drill holes. The property was held under a joint venture agreement between International, Degussa Exploration, and Jenkim Holdings (Canada) Ltd.

Legislation and Government Programs. Mineral taxes were revised by legislative action in 1990. The Omnibus Tax Bill, enacted as Chapter 604 of the 1990 Session Laws, froze for one year the production tax rate for iron ore and taconite concentrates produced in 1990. For tax law purposes, the definition of real property was amended to include iron ore and taconite minerals not otherwise exempt, and to exclude mine shafts, tunnels, and other underground openings used to extract ores and minerals. The bill added all clays to the list of minerals excluded from the net proceeds tax on mining. It also provided for a deduction of certain reclamation costs from the net proceeds tax.

Review by Nonfuel Mineral Commodities. Iron ore shipments were estimated to have increased 4% to 42.8 million metric tons in 1990. Cyprus Northshore Mining Corp. joined the six other Mesabi Range iron ore producers when it shipped its first pellets from Silver Bay on April 19. Cyprus completed renovation of the Silver Bay pelletizing plant, formerly operated by Reserve Mining Co., in early January. Shortly after plant startup, a fire damaged two of five precipitators, but these were quickly repaired and operations resumed by early March. Taconite ore for the plant was mined at the company's Babbitt Mine and railed 47 miles to Silver Bay.

Workers at Eveleth Mines approved a 39-month contract in May. The 665 members of the United Steel Workers of America Local 6860 approved the agreement that called for an immediate $1-per-hour pay raise, followed by a 25-cent-per-hour increase for each of the following two contract years. The contract will expire at the same time as four other taconite plant contracts on the Iron Range. In winning the agreement, workers staged a 48-hour strike after the previous contract expired.

In late September, Eveleth Taconite Co. was fined $43,000 by the Minnesota Pollution Control Agency (MPCA) for violating State hazardous waste rules. Specifically, the company was found to have stored about 1,800 55-gallon drums containing grease, asphalt, unspecified hazardous waste, or rock and dirt. Additionally, Eveleth was ordered to develop a hazardous waste management plan.

In late September, Inland Steel Co. began construction on its new Laurentian iron ore mine near Gilbert. Construction began within days of receiving a mine permit from the Minnesota DNR. The Laurentian will replace operations at the company's Minorca Mine, which is expected to be depleted of ore within 2 years. The new mine is 6 miles southeast of the Minorca and reportedly has a 40-year ore reserve, sufficient to provide 3.4 million long tons of pellets per year.

The Minnesota Sportfishing Congress announced in early March that it would sue LTV Steel Mining Co. for allegedly discharging high levels of toxic metals into waterways that drain into the Boundary waters Canoe Area wilderness near Babbitt. The Congress is an umbrella group representing individual anglers and angling clubs. The group alleged that discharges from waste rock stockpiles at LTV's Dunka open pit iron ore mine violate the Clean Water Act. In December 1989, the MPCA issued a notice of violation to LTV charging that toxic metals seeping from its rock stockpiles exceeded water quality standards. LTV disputed the MPCA claim and stated it is in compliance with its water quality permit. During 1990, the company, MPCA, and others sought a solution to improve the quality of water emanating from stockpiles. The essence of one solution was to deacidify the water with limestone, pass it through an organic filtration system to capture the metals, and then discharge the cleaned water.

National Steel Pellet Co. and the Hanna Research Center experimented with crushing of taconite ore instead of the traditional grinding methods. Preliminary results indicated that the procedure could be cost effective, improve productivity, and reduce energy consumption. Testing will extend into 1991, and a decision on whether to convert all 10 of National's primary grinding mills to the new method will follow. Should the change be implemented, the company estimated it would cost about $20 million and take 3 years to complete.

United Steel Workers Union officials and representatives from USX Corp. entered early contract negotiations on October 15. The current contract expires February 1, 1991. The union represents 18,000

workers in 7 states. About 1,300 of these workers are employed at the USX Minntac taconite operations at Mountain Iron. In late October, USX announced plans to make its steel operations a separate company. There was speculation that the move could ultimately result in the company's divestiture of its iron ore mines and steel mills.

Value of **construction sand and gravel**, the State's second leading mineral commodity, was estimated to have increased 8%, and output increased 3%. **Crushed stone** production was essentially unchanged, but value increased about 6%. **Dimension stone** production and value were estimated to have increased 35% and 30%, respectively. Production and value of **industrial sand** and **lime** were at about the same levels as in 1989. Sales of **peat** increased 19%, and value increased about 17%. **Clay** production and value increased 9% and 15%, respectively. In September, Minnesota Valley Minerals announced intentions to form a kaolin mining and processing company with operations near Belview. The company planned to process kaolin into filler for soybean meal.

MISSISSIPPI

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Annual, Estimated

THE MINERAL INDUSTRY OF MISSISSIPPI IN 1990

Mississippi's 350 mines produced nonfuel mineral commodities valued at $122 million in 1990, according to estimates by the U. S. Bureau of Mines. This mineral value was an increase of $14.5 million over that reported in 1989. The increase was due primarily to a higher demand for and production of portland cement, construction sand and gravel, and crushed stone. Mississippi ranked 41st nationally in total nonfuel mineral output and was an important producer of common clay, bentonite, and fuller's earth.

During 1990, work began on the State's second ball clay mine, the only cement plant in the State continued operations under a new owner, and a steel mill expansion was announced.

Table 1 --Nonfuel mineral production in Mississippi 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- short tons --	1 093 318	$24 584	899 373	$23 573	1 244 603	$23 088
Gem stones ----------	NA	1	NA	5	NA	5
Sand and gravel (construction) thousand short tons --	13 314	38 806	e/15 600	e/51 500	17 000	59 000
Stone (crushed) ---------- do --	e/1 500	e/9 000	1 069	3 994	1 400	5 500
Combined value of cement (masonry (1988-89), portland), clays (ball) and sand and gravel (industrial) ------	XX	31 029	XX	28 539	XX	34 511
Total----------	XX	103 400	XX	107 611	XX	122 104

e/Estimated NA Not available XX Not applicable
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers)
2/Excludes certain clays; kind and value included with "Combined value" figure

Legislation and Government Programs. Copiah County supervisors, legislators, and gravel company officials drafted legislation that would place a $0.50 per cubic yard severance tax on gravel mined in the county but sold outside its boundaries. It was estimated that the tax, which would be used to improve county roads and bridges, would raise about $100,000 per year. A meeting to review the draft tax proposal was scheduled for January 1991.

The Mississippi Office of Geology was under contract to Millsaps College to assist with an economic mineral study in Lauderdale County. Millsaps was working with Jackson State University on a grant from the U.S. Bureau of Mines to obtain and analyze samples of the State's clays. The Office of Geology published a report on coal underlying Clay County in northeast Mississippi. The research identified 5.2 billion tons of coal in 15 coalbeds within 4,000 feet of the surface.

The Mississippi Mineral Resources Institute was awarded a $62,000 grant by the Energy and Transportation Division of the Mississippi Department of Economic Development to develop data to aid municipalities to assure low-cost natural gas supplies. Such supplies would aid existing industry, including those in mineral processing, in addition to attracting new business.

The Appalachian Regional Commission granted the State $150,000 to improve a road that serviced Mississippi's only hard limestone quarry. A bridge on the road was destroyed by heavy rains, and the stone company built a temporary bypass around the bridge. The quarry employed 29 workers; an additional 81 jobs were related to the quarry operations.

Review by Nonfuel Mineral Commodities. **Sand and gravel**, **portland cement**, and **clays** were the three leading mineral commodities mined in-State. Estimated production of these three mineral commodities accounted for over 75% of the State's mineral value.

Holnam Inc., a holding company for the world's largest cement manufacturer, the Swiss-firm Holderbank, purchased United Cement Co. in Artesia. The late summer sale by cement plant owner, Texas Industries Inc., was for $61 million. The Lowndes County cement operator, which began operations in 1973, employs 109 workers.

United Clays opened Mississippi's second **ball clay** mine in Quitman County in the northwest part of the State. Clay from the new operation will be sold to the ceramic fixture and fiberglass industries. United Clays is owned by Watts Blake Bearne & Co. PLC (WBB) of Newton Abbot, England, the world's largest producer of ball clay.

Common clay producers, the State's brick companies, reported brisk sales during the first half of 1990. Sales in the second half, however, fell alarmingly as both residential and commercial construction slowed.

Birmingham Steel Corp., Birmingham, AL, announced a $45-million expansion of its Mississippi **steel** facility at Flowood. The expansion, which will add about 60,000 square feet to the plant, will include a new melt shop and boost steel production from 230,000 short tons per year to 500,000 short tons per year. Rolled steel output is scheduled to increase from 280,000 short tons to 400,000 short tons annually.

MISSOURI

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Annual, Estimated

THE MINERAL INDUSTRY OF MISSOURI IN 1990

The value of nonfuel mineral production in Missouri in 1990 was approximately $1.1 billion, according to estimates by the U.S. Bureau of Mines. This was an increase of about 6% over that of 1989. Industrial minerals accounted for nearly 50% of the total. The State ranked 10th in the Nation in the production of nonfuel minerals. Missouri was the Nation's leading producer of fire clay, lime, and lead. It ranked second in the production of crude iron oxide pigments; third in barite and iron ore; fourth in zinc; fifth in portland cement and fuller's earth; and sixth in copper. Commodities contributing the most to the State's nonfuel mineral value were, in descending order: lead, crushed stone, portland cement, lime, and zinc. Mining employment in September 1990, the latest month for which statistics are available, totaled 5,300 jobs, the same as in September 1989.

Table 1 --Nonfuel mineral production in Missouri 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Barite --------- thousand metric tons --	24	$1 930	W	W	W	W
Cement:						
Masonry -------- thousand short tons --	153	6 310	W	W	W	W
Portland ------------------------ do --	4 679	184 755	4 922	$182 005	4 600	$170 200
Clays2/ ------------------ metric tons --	1 435 045	12 171	1 479 898	14 665	1 426 925	13 594
Iron ore -------- thousand metric tons --	816	W	1 060	W	947	W
Lead3/ ------------------- metric tons --	353 194	289 194	366 931	318 320	384 976	390 414
Sand and gravel:						
Construction --- thousand short tons --	11 217	32 941	e/10 000	e/32 500	11 800	40 200
Industrial ---------------------- do --	744	9 876	750	9 972	765	10 650
Silver3/ ----------------- metric tons --	45	9 550	53	9 456	43	6 912
Stone:						
Crushed -------- thousand short tons --	e/52 100	e/183 000	51 754	171 848	54 700	190 900
Dimension ---------------- short tons --	e/3 644	e/547	W	W	W	W
Zinc3/ ------------------- metric tons --	41 322	54 842	50 790	91 885	51 555	85 244
Combined value of clays (fuller's earth), copper, gem stones, iron oxide pigments (crude), lime, and values indicated by symbol W ------------------	XX	182 833	XX	r/220 464	XX	202 188
Total----------------------------------	XX	987 949	XX	1 051 115	XX	1 110 302

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Recoverable content of ores, etc.

Environment. In February, the National Park Service (NPS) asked the U.S. Environmental Protection Agency to designate a 967-square-mile area in south central Missouri a sole source aquifer. The designation would presumably be possible under provisions of the Federal Safe Drinking Water Act. The

area includes part of the Current River-Ozark National Scenic Riverway north of Van Buren, MO, which is administered by the NPS. The Scenic Riverway is north of the Mark Twain National Forest parcel where The Doe Run Co. has been trying to win preference right leases from the U.S. Forest Service (USFS) and U.S. Bureau of Land Management (BLM) to continue exploration drilling for lead and zinc. In late December 1988, the USFS filed its record of decision that recommended the BLM grant the leases. The action was appealed by environmental groups. In late March, the USFS determined that available environmental information was insufficient, and that the leases could not be issued. There was concern that granting a lease for exploration would have also permitted development. The result is that Doe Run must submit a mine plan prior to the completion of USFS deliberations on the applications. Toward this end, the USFS, in late July, began conducting an environmental analysis concerning a Doe Run proposal to drill up to 20 additional exploration holes to collect the necessary information for a mine plan. The drilling would be authorized under an exploration license/special use permit. Opponents of the Doe Run proposal have voiced concerns about aquifer pollution resulting from exploration and potential mining operations as a sufficient reason to deny Doe Run the leases. The draft Environmental Impact Statement (EIS) released in late 1987 by the USFS and BLM also listed potential water pollution as a concern. Ground water dye trace study results presented in the EIS indicated ground water flow patterns generally south and away from the main part of the Current River Scenic Riverway but reported a potential for pollution of the Big Spring Watershed. Big Spring is an isolated southern extension of the Scenic Riverway. This leasing issue is important because of rapidly depleting lead ore reserves and the approximate 10-year lead time needed for a new mine startup.

In March, the Missouri Department of Natural Resources (DNR) placed the Pea Ridge Iron Ore Co. on a schedule to reduce iron oxide particulate air emissions and to bring the operation into compliance with the State's Air Conservation Law. Under an agreement between the two parties, Pea Ridge had until December 31 to install pollution control equipment on one of its five furnaces. At the end of a 30-day period, emission test results were delivered to the DNR. If successful, installation of the multi-cyclone cleaning equipment is to be undertaken at the rate of one furnace each year through 1994.

The Missouri DNR, Division of Geology and Land Survey, continued work on its geologic mapping project at the Pea Ridge iron ore mine. The mine provides a three-dimensional view of a deposit thought by researchers to be an analog to a large copper, gold, silver, uranium, and rare-earth element deposit in southern Australia. Mapping here may lead to discovery of similar deposits elsewhere in the Midcontinent.

The U.S. Bureau of Mines Rolla Research Center studied mineral processing methods to recover rare-earth elements occurring in breccia pipes at the Pea Ridge Mine. Research has focused on using single-stage gravity separation followed by flotation to remove phosphate mineral impurities. The Center also was involved with research to treat lead mill tailings. One part of the study used canola oil to collect sulfide minerals instead of more traditional, and generally toxic, systems. The Bureau also studied pyrometallurgical waste treatment methods to recover zinc and silver from slag, while producing a nonhazardous slag for environmentally safe disposal. This study was done in cooperation with the Big River Zinc Corp.

Legislation and Government Programs. Revisions to Missouri's Mining and Land Reclamation Act were signed into law in July. The law, introduced as House Bill 1584, will provide regulation and control of strip mining and declare it a matter of State policy to strike a balance between mining and reclamation. Procedures for permits and fees also were revised.

In the November general election, the Natural Streams Act--a ballot initiative proposed by the Natural Streams Campaign--was defeated. The initiative sought to designate 52 Missouri streams as "natural streams," with uses to be controlled by a citizens' commission in cooperation with local governments, landowners, and conservation and recreation groups. There was widespread concern that limits on some recreational uses would be created and that new restrictions would be imposed on land uses such as logging, mining, and real estate development.

Review by Nonfuel Mineral Commodities. In 1990, **lead** production and value were estimated to have increased 5% and 23%, respectively. The year saw a change in the ownership picture of Missouri's lead industry. In May, Homestake Mining Co. announced it would sell its 42.5% share in The

Doe Run Co. to its partner, Fluor Corp., for $125 million. Doe Run is the largest fully-integrated domestic producer of primary lead. Shortly afterward, Fluor granted Doe Run permission to proceed with construction of a new lead recycling plant. The $34 million facility had won State and Federal permits in 1989. Fluor has been trying to divest itself of its metals holdings since 1988. The change in ownership was viewed as a way to make Doe Run more easily marketable to another buyer. At yearend, there were no apparent interested parties.

In September, Doe Run's Buick Mine was named a winner in the underground metal category of the prestigious Sentinels of Safety trophy. The annual competition is cosponsored by the Federal Mine Safety & Health Administration and the American Mining Congress. The Buick operations completed 147,624 hours without a lost-time accident to win the award.

The production of **crushed stone** accounted for about 17% of the State's total nonfuel mineral value. Production and value were estimated to have increased 6% and 11%, respectively. Fred Weber Inc.'s North Quarry in St. Louis County received the Missouri Limestone Producers' Association's Hillenkamp-Rush Memorial Safety Award. Safety achievement awards for no lost-time accidents also were presented to 28 other producers.

Portland cement production and value each decreased about 7%, but **masonry cement** production and value increased about 6% and 8%, respectively. In December, Lone Star Industries Inc., filed for protection from creditors under Chapter 11 of the U.S. Bankruptcy Code. The company said it was filing for protection because it couldn't meet certain obligations under its agreements with creditors and because it had been hurt by diminishing housing construction starts and greater foreign competition. Lone Star, one of the largest cement companies in the U.S., operates plants in several States, including one in Cape Girardeau County, MO.

In mid-December, Lafarge Corporation, Reston, VA, began transactions to acquire various operations of Cementia Holdings AG of Zurich, Switzerland, including the Kansas City, MO, plant of its Missouri Portland Cement Co. subsidiary. Also included in the proposed agreement were cement manufacturing plants in Illinois and Iowa, more than 30 related ready-mixed concrete and aggregate operations, and 16 terminals along the Mississippi River and its tributaries. Lafarge reportedly would become the second largest coment producer in the Mississippi River region, with a combined capacity of 3.8 million short tons of cement. The transactions were expected to be completed in January 1991.

Shipments and value of **iron ore** decreased nearly 11%. Pea Ridge Iron Ore Co. is the State's only producer of iron ore and operates the Nation's only underground iron ore mine. On July 2, Fluor Corp. announced that it had sold Pea Ridge to Big River Minerals Corp. of St. Louis for about $12 million. Fluor had been trying to sell the iron producer since 1987. Included in the transaction were the mine and pelletizing plant.

Lime production and value both increased about 4%. **Clay** production and value during 1990 were estimated to have decreased about 4% and 7%, respectively. **Barite** production and value posted significant increases of 16% and 20%. This marked a turnaround largely because of increases, or anticipated increases, in oil well drilling, which were brought on by the Middle East crisis. The barite sector had posted production declines since a severe downturn in the oil industry began in the mid-1980's.

MONTANA

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Annual, Estimated

THE MINERAL INDUSTRY OF MONTANA IN 1990

The estimated value of nonfuel mineral production for Montana in 1990 dropped to $573.8 million, a decrease of almost 4% from 1989, according to the U.S. Bureau of Mines. A drop in the value of production for copper, molybdenum, and platinum group metals more than offset the increased values estimated for portland cement, gold, crushed stone, and zinc production. Metallic minerals--copper, gold, iron ore, lead, molybdenum, platinum group metals, silver, and zinc--accounted for more than 81% of the State's total nonfuel mineral production value. Montana ranked 20th nationally in that value, compared with 18th in 1989.

Table 1.--Nonfuel mineral production in Montana 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- metric tons --	91,802	$1,416	95,743	$1,835	200,945	$4,306
Gem stones ----------	NA	1,602	NA	2,500	NA	2,500
Gold3/ ---------- kilograms --	294,976	129,291	11,623	142,965	13,090	159,924
Gypsum ---------- thousand short tons --	27	W	W	W	W	W
Lead3/ ---------- metric tons --	8,266	6,768	W	W	W	W
Platinum-group metals --- metric tons --	W	W	6,280	85,318	6,998	47,000
Sand and gravel (construction) thousand short tons --	7,984	20,225	e/5,800	e/13,900	5,500	13,900
Silver3/ ---------- metric tons --	192	40,457	194	34,367	213	34,241
Stone (crushed) - thousand short tons --	e/1,800	e/4,500	2,846	9,718	4,500	15,300
Talc and pyrophyllite --- metric tons --	415,642	14,524	453,978	12,718	W	W
Zinc3/ ---------- do.--	18,935	25,130	W	W	W	W
Combined value of barite (1989-90), cement, clay (fire clay), copper, graphite (natural, 1988-89), iron ore, lime, molybdenum, peat, phosphate rock, sand and gravel (industrial), stone (dimension), vermiculite, and values indicated by symbol W ----------	XX	332,630	XX	r/292,394	XX	298,610
Total----------	XX	576,543	XX	595,715	XX	573,781

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Recoverable content of ores, etc.

Although a drop in prices drove down the value of some metals, the quantity of metallic mineral production in Montana remained strong. Platinum group metals, which had the largest decline in absolute value for the State in 1990, actually had an increase in production of 718 metric tons. A diversity of industrial minerals continued

to be produced in the State. Total production value of industrial minerals increased 11% from 1989.

Exploration. The Montana Department of State Lands reported a total of 202 active exploration permits in 1990, down from 210 in 1989. The U.S. Bureau of Land Management reported the filing of 6,692 new mining claims in 1990, for a total of 73,879 active claims in the State. There were 339 plans of operation filed with the U.S. Forest Service, compared with 391 reported in 1989. Deer Lodge National Forest had the most at 85, followed by Lolo, Kootenai, Helena, Beaverhead, and Gallatin. With companies trending toward smaller projects but more of them, the Montana Bureau of Mines and Geology believed that exploration expenditures in Montana for 1990 dropped from the $26 million calculated for 1989.

In the southwest region, Crown Butte Resources Inc. and Noranda Minerals Corp. continued drilling and other exploratory work at their New World Project near Cooke City. The companies indicated that initial results were promising and they will begin the permitting process in 1991. The property contains two open-pitable deposits and an underground reserve. Phelps Dodge Mining Co. joined Chrome Corp. of America in a venture to explore and develop platinum group metals and/or continue Chrome Corp.'s ferrochrome project in the Stillwater Complex. The agreement included a drilling program at the Mountain View and Benbow Mines as well as Cresent Creek.

Phelps Dodge and Canyon Resources Corp. announced discovery of an open-pitable gold deposit on the 7-Up Pete property. Phelps Dodge completed extensive drilling and the companies were doing predevelopment work, including gathering baseline data necessary for permitting. North of 7-Up Pete, Phelps Dodge continued drilling in McDonald Meadows. Elsewhere in the Helena region, in search of massive sulfides, the partnership of Cominco American Resources Ltd. and BHP Utah Inc., drilled on their Sheep Creek project, and Kennecott Exploration Co. drilled in the area of Geis and Sawmill Creeks.

In the northwest region, drilling and trenching was done by Western Gold Exploration & Mining Co. (Westgold) on its Londondarry project near Maxville, and by Kennecott on its Silver King project in Sluice Creek. Drilling also was done by Phelps Dodge on its Karger Project, on the Bullion Parks Project by Pegasus Gold Inc., and by Newmont Exploration Ltd. on Esmeralda Hill. Orvana Resources continued exploration on its Libby gold project.

In the Butte region, Cloverleaf Gold Co. purchased the Maltby's Mound project, west of Norris, from Newmont Exploration. The company prepared for permitting by doing reserve studies and an environmental assessment. Swansea Gold Mines optioned and explored Sandhurst Mining's Ruby Creek project. Other drilling and trenching was done by Highland Gold in the Fish Creek drainage, by Pacific Gold Mines Inc. at the Yellowband Mine, and by Billiton Minerals around the Garrison Mine west of Virginia City.

Environment. There was disagreement between the U.S. Environmental Protection Agency (EPA) and city officials of East Helena over EPA's plans to dig up and remove soil near Asarco Inc.'s lead smelter. Parts of the city have been declared a Superfund hazardous waste site and the EPA planned to dig up as many as 50 residential properties and to remove dirt from nearby parks, playgrounds, and ballfields. Asarco also opposed the planned action. Reportedly, EPA officials believe they have the authority to proceed with the cleanup, despite the objections, and have said that more than 200 residential yards may be dug up over the next three to five years.

Legislation and Government Programs. The Montana Department of Natural Resources and Conservation awarded the Montana Bureau of Mines and Geology a State grant of just under $150,000 to study the use of zeolites in the cleanup of polluted water and soil. The object of the study is to determine the use of zeolites in selectively removing metals from water and other fluids. Emphasis will be placed on the effectiveness of zeolites in reclaiming tailings ponds and soils.

The Governor of Montana proposed placing all environmental regulation under a single agency. Under the proposal, the Environmental Sciences Division of the State's Health Department and the

Reclamation Division of the Department of State Lands would be combined with the Department of Natural Resources to form the Department of Natural Resources and Environment. The proposal, which would lead to "one-stop permitting", will be presented to the 1991 Montana Legislature.

Review by Nonfuel Mineral Commodities. Pegasus Gold was active in the State. The company continued construction of a new leach pad at its Zortman-Landusky **gold** mine in Phillips County. At Basin Creek, Pegasus built a eleven million-ton heap-leach pad and was enlarging the mining operation. Pegasus also enlarged the leach pad at its Beal Mountain Mine near Anaconda. Reclamation of Beal Mountain's waste dump and leach pad dike was completed. After encountering lower than expected grades and reserves at its Montana Tunnels Mine, Pegasus adopted a new mining plan to reduce the strip ratio, and modified the mill to improve recoveries.

After posting a $38 million bond, Placer Domes' Golden Sunlight Mine near Whitehall received a permit for an expansion expected to extend the mine life until 2006. Canyon Resources completed construction of a new heap-leach pad and nearly doubled processing capacity at its C.R. Kendall gold operation in Fergus County. The Mineral Hill Mine, a joint venture of American Copper and Nickel Co. and Homestake Mining Co., completed its first full year of production.

In the Judith Mountains, Blue Range Mining Co. continued production and development of the Geis gold mine. The company produced from two levels, was developing a third level, and was driving a decline toward a fourth level. The company added a leach circuit to the mill to accommodate ores from other sources in the Giltedge district. Cusac Industries purchased Gulf Titanium Ltd's 50% interest in the Cruse-Belmont gold mining project. Production was later stopped following poor recovery of gold values from the mill.

Montana Resources Inc. continued to produce **copper**, **molybdenum**, and **silver** at its Continental Pit in Butte. Also in Butte, New Butte Mining Co. developed and produced from multiple **lead-zinc** veins containing silver and gold. The mine did not return to full production following a temporary closure due to labor difficulties at Cominco's smelter in Trail, British Columbia.

Stillwater Mining Co. began matte production at its new $6.6 million **platinum** smelter at Columbus. The matte was shipped to Belgium for further processing. The smelter employed about 20 workers. Stillwater's mine and mill that provide concentrate for the smelter are sited 40 miles away near Nye in the Stillwater Complex. The mine utilized the only tunnel boring machine in Montana. The company was considering opening a second mine, the East Boulder Project, south of Big Timber, which would provide additional concentrates for the Columbus facility.

Montana Reserves Co. was attempting to sell part or all of its 45% interest in the Montanore silver-copper deposit near Libby. The company was unable to pay its portion of project development costs. Noranda Minerals Corp., owner of the other 55% interest, stated that financial problems will not delay the project and continued to drive an 18,000-foot decline toward the ore body. A draft environmental impact statement was completed and was being reviewed. The Montanore reportedly may be the largest silver ore deposit in the world. Nearby, Asarco continued to operate its Troy Unit, an underground silver-copper mine. The company expanded its efforts to prove up additional reserves.

Pfizer Inc. began construction of a $8.6 million fully-automated **talc** beneficiation plant that will utilize wet grinding and flotation technology. Sited south of Dillon, the company expects the plant to be in full production in 1991. Near Townsend, Continental Lime Inc. initiated an expansion project at its plant to double capacity for producing **quicklime**. W.R. Grace & Co. closed its **vermiculite** mine near Libby, Lincoln County, after nearly 30 years of operation; the mine was closed as a result of a decline in demand for vermiculite.

Cominco American Resources produced **phosphate** rock at its Warm Springs Creek operation, the last underground phosphate mine in the Nation. Cominco ships the phosphate to its smelter in Trail, British Columbia, where it is made into phosphoric acid and other phosphate-based products.

NEBRASKA

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Annual, Estimated

THE MINERAL INDUSTRY OF NEBRASKA IN 1990

The value of nonfuel mineral production in Nebraska in 1990 was approximately $106 million, an increase of about 2% over that of 1989, according to estimates by the U.S. Bureau of Mines. The increase resulted from greater sales of construction and industrial sand and gravel and crushed stone. Minerals produced in Nebraska, in decreasing order of value, included construction sand and gravel, portland cement, crushed stone, lime, clays, masonry cement, industrial sand and gravel, and gem stones. Nationally, Nebraska ranked 43rd in the production of nonfuel minerals. Most of the State's nonfuel minerals were used in construction; exceptions were industrial sand used in glassmaking and as foundry sand, and gem stones.

Table 1 --Nonfuel mineral production in Nebraska 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	215,419	$786	224,624	$880	219,154	$901
Gem stones ----------	NA	10	NA	2	NA	2
Sand and gravel (construction) thousand short tons --	11,229	28,928	e/15,200	e/41,800	15,800	45,700
Stone (crushed) ---------- do --	e/4,900	e/22,000	1,978	20,050	4,000	21,200
Combined value of cement, lime, and sand and gravel (industrial) ----------	XX	39,468	XX	41,085	XX	38,587
Total----------	XX	91,192	XX	103,817	XX	106,390

e/Estimated. NA Not available. XX Not available.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Environment. Selection of the Boyd County low-level nuclear waste disposal site late in 1989 proved to be a major issue throughout 1990. U.S. Ecology, a unit of American Ecology Corp., selected a 200-acre site near Butte in 1989 for an above ground concrete vault facility. The $40-million facility would store low-level radioactive medical wastes and nuclear power plant equipment from Arkansas, Louisiana, Nebraska, and Oklahoma. These States comprise the Central Interstate Low-level Radioactive Waste Compact. In late July 1990, U.S. Ecology submitted a formal application for construction and operation of the facility to the Nebraska Department of Environmental Control. Some local citizens and others in surrounding areas, including nearby South Dakota, are strongly opposed to the plan which, under a Federal Nuclear Regulatory Commission mandate, must be in operation by 1993. This is the same deadline other similar compacts throughout the U.S. must meet. However, only California and Nebraska have progressed far enough to possibly meet the deadline. Opponents to the site are concerned about safety risks to health and ground water supplies, should the facility develop a leak.

The University of Nebraska Conservation and Survey Division continued work on updating and revising water well test drilling logs to include abbreviated descriptions of stratigraphy and lithology. The logs are useful in identifying potential industrial mineral resources, particularly sand and gravel and crushed stone. The Division also began work on a new open-file report series called Geonotes, which provides geologic information about specific mineral commodities occurring in Nebraska.

Review by Nonfuel Mineral Commodities. **Construction sand and gravel** production and value increased about 4% and 9%, respectively. **Industrial sand** production and value increased markedly. **Portland cement** shipments and value each fell about 7% in 1990 compared with 1989 figures. **Masonry cement** shipments and value were at about the same levels as in 1989.

Crushed stone production was at about the same level as in 1989, but the value increased about 6%. **Lime** production and value were unchanged. **Clay** output declined about 2%, but value increased about 2%.

Activity at the Crow Butte Uranium Mine was slowed in May and remained so at yearend when the Nuclear Regulatory Commission (NRC) ruled that operations could not begin until the operator, Ferret Exploration of Nebraska Inc., could find an acceptable radioactive waste storage site. Under a previous agreement with NRC, the company has stored at the site radioactive waste generated during a 5-year operation of a pilot plant. In May, the Nebraska Department of Environmental Control issued Ferret a commercial **uranium** mine permit. If the disposal issue is resolved, Ferret expects an annual uranium production of 1 million pounds for 20 years. Uranium will be mined from a 2,500-acre area by injecting, through wells, a solution composed of water, oxygen, and sodium carbonate to depths of 400 to 800 feet. Recovery wells will collect the solution and dissolved uranium.

NEVADA

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Annual, Estimated

THE MINERAL INDUSTRY OF NEVADA IN 1990

Nevada's 1990 nonfuel mineral production was estimated by the U.S. Bureau of Mines to be valued at $2,626 million, an increase of $307 million from that of 1989. A 19% increase in gold production to an estimated 184,548 kilograms accounted for most of the increase. Silver production declined 4% to 600 metric tons. Nevada was the leading State in the Nation in the production of gold, silver, mercury, and barite; second in the production of diatomite, fluorspar, and lithium; and was the sole producer of mined magnesite. Nevada was third among States in the Nation in the 1990 production of nonfuel minerals.

Table 1 --Nonfuel mineral production in Nevada 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Barite --------- thousand metric tons --	289	$5,053	209	$3,473	392	$6,934
Clays2/ ------------------ metric tons --	26,186	2,143	57,264	5,457	56,661	8,111
Gem stones ------------------------------	NA	280	NA	1,402	NA	402
Gold3/ --------------------- kilograms --	114,322	1,611,020	154,573	1,901,280	184,548	2,254,672
Perlite ------------------- short tons --	5,000	142	5,000	136	W	W
Sand and gravel:						
Construction --- thousand short tons --	15,729	50,928	e/20,000	e/70,000	25,400	93,500
Industrial ---------------------- do --	502	W	718	W	W	W
Silver3/ ----------------- metric tons --	608	127,760	625	110,442	600	96,452
Stone (crushed) - thousand short tons --	e/ 4/1,300	e/ 4/5,700	1,560	4,638	1,600	5,000
Combined value of cement (portland) clays (kaolin), copper, diatomite, fluorspar (1988-89), gypsum, lead (1988, 1990), lime, lithium minerals, magnesite, mercury, molybdenum (1989), salt, stone (crushed dolomite, 1988), zinc (1990), and values indicated by symbol W ------------------------------	XX	151,356	XX	222,240	XX	160,483
Total------------------------------	XX	1,954,382	XX	2,319,068	XX	2,625,554

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Recoverable content from ores, etc.
4/Excludes certain stones; kind and value included with "Combined value" figure.

Gold production continued to increase despite a slight drop in the average annual price to about $380 per troy ounce from the 1989 price of $383 per troy ounce. Lower silver and gold prices resulted in closures of some marginal precious metals operations at the same time many of the larger northern Nevada gold mines were increasing

production and new mine startups were initiated. The Nation's major source of prime virgin mercury since 1975, the McDermitt Mine in Humbolt County, was closed at the end of November because of continuing poor market conditions.

Employment. According to the Nevada Employment Security Department, employment in the Nevada mining industry reached 15,600 workers in October 1990, compared with 13,500 workers in November 1989. Of these, more than 13,000 workers were employed in metal mining.

Exploration. Precious metals exploration activities in the State declined somewhat as local companies' interests shifted to other States, but drilling continued throughout Nevada centered primarily around known gold mines in the northern part of the State. Chevron Resources explored Elko County mining claims held by Horizon Gold Shares near the Tuscarora Mine. FMC Gold Co. explored the Rossi Gold property in Eureka County. Santa Fe Pacific Minerals Corp. defined a significant new gold deposit southeast of Winnemucca in Humbolt County which they designated the Lone Tree Deposit. Royal Gold Inc. conducted exploration drilling in Lander County's Crescent Valley near the Gold Acres and Cortez Mines. Round Mountain Gold Corp. and others did exploration drilling near Manhattan in the Toyabee National Forest in Nye County. Beginning in June, USMX Inc. explored Alligator Ridge trend properties in White Pine County by drilling eight target areas.

Legislation and Government Programs. Because the Nevada legislature meets only during odd-numbered years, legislation for 1990 was held in abeyance until 1991. The Nevada Department of Minerals published a new booklet "Mineral Industries in the Nevada Economy" to explain modern mining to the general public. They also prepared, with the Nevada Bureau of Mines and Geology, Special Publication 10, "Major Mines of Nevada - 1989", a first of an annual series of summary reports on major mines of Nevada.

Review by Nonfuel Mineral Commodities. **Gold** production continued to increase as new mines came onstream and older operations expanded. In August, Santa Fe Pacific Gold Corp. poured the first gold bar from its Rabbit Creek Mine in Humbolt County. Gold King Consolidated Inc. poured its first gold and silver dore in June at the Adelaide Crown Project, also in Humbolt County. The Ivanhoe Joint Venture Gold Mine in Elko County poured its first gold bar in October. USMX began leaching ore at its Casino Mine in White Pine County in September.

Atlas Precious Metals Inc. began construction at three open pit operations in the Roberts Mountains of Eureka County, collectively labeled Gold Bar II. Underground mining and the startup of a sulfide circuit at Echo Bay Mines Inc.'s McCoy/Cove open pit operation in Lander County increased production of gold and silver. Also in Lander County, NERCO Minerals Co. and Alta Gold Co. brought the Elder Creek Mine south of Battle Mountain into production in January. U.S. Gold began production from their Tonkin Springs Mine in Eureka County in April using a bio-oxidation recovery method and becoming the second company in the world to use this type of recovery.

FMC Gold Co. began a $7.6 million heap-leach gold cyanidation project at their Ketchup Flat gold-silver deposit in Nye County.

Silver operations at the NERCO Inc. Candelaria silver mine near Hawthorne were suspended in November because of lower silver prices, which closed at the end of October at a 15-year low of $4.20.

Mercury production at the Nation's sole, primary virgin mercury mine, Placer Dome U.S. Inc.'s McDermitt Mine in Humbolt County, was halted in November because of poor marketing conditions. The mine had announced production of its 300,000th flask of mercury in July, but a decline in the market price from $335 in 1988 to $200 in November 1990 made operations unprofitable.

A special use permit for **barite** mining, stockpiling, and shipping was granted to the BSO Co. by the Humbolt County Regional Planning Commission for an operation near Golconda.

NEW HAMPSHIRE

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Annual, Estimated

THE MINERAL INDUSTRY OF NEW HAMPSHIRE IN 1990

The value of nonfuel mineral production in New Hampshire in 1990 was estimated by the U.S. Bureau of Mines to be $37 million. This value represents an increase of $4 million from that of 1989. Construction sand and gravel and crushed and dimension stone accounted for most of the State's mineral production; common clay and gem stones accounted for the remainder. Gypsum, imported to the State, was calcined at one plant to manufacture wallboard.

The Portsmouth Port Authority unveiled plans for a $25 million to $30 million port expansion in conjunction with a $581 million industrial development at a separate site in the area. An out-of-State developer proposed to finance a three-pier expansion at the Port in exchange for setting up a coal slurry pipeline at the location. The pipeline, using coal received at the Port, would ship the liquified material to powerplants. The developers also plan to spend $581 million to construct a 400-megawatt powerplant, a small-scale steel mill, and a concrete facility elsewhere in the area. The Governor and Executive Council must review and approve the plans before construction could begin.

Table 1 --Nonfuel mineral production in New Hampshire 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$100	NA	$51	NA	$51
Sand and gravel (construction) thousand short tons	9,089	32,614	e/6,000	e/20,400	8,000	28,600
Stone:						
Crushed do	e/2,400	e/9,800	771	4,020	500	2,700
Dimension short tons	e/73,393	e/10,546	55,305	8,769	45,073	6,029
Total2/	XX	53,060	XX	33,240	XX	37,380

e/Estimated NA Not available XX Not applicable
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers)
2/Partial total, excludes values which must be concealed to avoid disclosing company proprietary data.

Legislation and Government Programs. Proposals to tighten regulations on quarrying and mining, establish a construction aggregate severance tax, and dispose solid waste were introduced during the 1990 legislative session. In the case of tightening regulations on mining, House Bill (H.B.) 1429 was killed in committee before the Legislature adjourned in April. Both the Construction Aggregate Severance Tax

bill (H.B. 382-FN-A) and Landfill Reduction and Cleanup Act (H.B. 734-FN-A) remained in committee hearings at adjournment and may be taken up again in the 1991 legislative session. One bill (H.B. 1438) which was signed into law sets a goal of attaining a 40% solid waste reduction by the year 2000.

The State Supreme Court upheld a lower court ruling preventing a company from operating a sand and gravel pit in Barrington. In 1986, the company had received permission from the town to mine 3 acres of land. However, in May 1987, an investigation by the town revealed that land outside the 3-acre area was being mined. The defendants received a cease and desist order in July, which, according to the Court, was ignored. Later that summer, Strafford Superior Court ruled that all mining activities cease and fined the company $8,000 and awarded $14,000 to the town for legal fees. The gravel pit operators appealed the decision on the basis that mining began prior to August 1979, and thus, by State law, the operation was grandfathered. However, the State Supreme Court ruled that the activity on the property in 1979 did not constitute a mining operation.

Review By Nonfuel Mineral Commodities. Near yearend, the State Department of Environmental Protection (DEP) fined Mick Construction Co., South Berwick, $12,000 for creating a sand and gravel pit larger than is allowed by law. The fine was imposed after the DEP discovered that the gravel pit in Berwick had grown to 29 acres, 24 acres over DEP standards. The State enacted a law in 1970 limiting gravel pit expansion to 5 acres. The DEP indicated it had aerial photographs that prove the company did not have the pit operating in 1970. The DEP is currently drafting a set of gravel pit rules to provide more guidance to gravel pit operators.

Several towns in New Hampshire rewrote regulations or were writing new ones for **sand and gravel** mining operations. The revisions are the result of a State law (Chapter Law 363) passed in 1989 requiring towns to have more extensive regulations than were required previously. One major change is that the new State law requires all excavations to have reclamation plans. New gravel excavation regulations were written in Bennington and Charlestown; the towns of New Ipswich and Winchester were also rewriting their sand and gravel ordinances.

National Gypsum Co. reported the completion of $17 million in production improvements at its wallboard manufacturing plant in Portsmouth. The 5-year modernization project included a new laboratory, mixers, kiln, and bundler. The plant, which employs nearly 100 people, imported crude **gypsum** from the company's subsidiary in Canada, through the Port of Portsmouth.

The Norton Co., a leading producer of **abrasives**, announced that they were joining with Micromold Italia, an Italian abrasive producer, to manufacture a new line of high-quality fine grit abrasives products in Littleton. The abrasives will be used for honing and superfinishing metals and other materials. Micromold, a small company near Milan, Italy, was purchased by Norton in 1988. Norton intends to import abrasive blanks from the Italian plant and convert the blanks into sizes and shapes for North American customers. Extensive renovations were made at the Littleton facility to accommodate the new process.

NEW JERSEY

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Annual, Estimated

THE MINERAL INDUSTRY OF NEW JERSEY IN 1990

The value of nonfuel mineral production in New Jersey in 1990 was estimated by the U.S. Bureau of Mines to be $235 million. This represents a decrease of $14 million from 1989, primarily the result of lower sales of crushed stone and construction sand and gravel, the State's leading mineral commodities in terms of value. Other commodities mined or recovered included clays, greensand, industrial sand, peat, and zircon. New Jersey was the only State that produced greensand, which is used primarily for water filtration. The State ranked fourth of 38 States that produced industrial sand and sixth in exfoliated vermiculite output.

The New Jersey economy continued to sag throughout the year signaling a further erosion of construction, retail, and other business activity. Residential and nonresidential construction, which rely heavily on aggregates, remained well below the peak of 2 or 3 years ago. In the first 11 months of 1990, the value of total construction contracts in the State was 25% lower than that of the same period in 1989. This construction slowdown also resulted in a loss of nearly 29,000 jobs in this sector since early 1989. As a result of these construction contract declines, production of aggregates continued to decline. In 1990, output of crushed stone, the State's leading mineral commodity, fells 11% from that of 1988. Output of construction sand and gravel, the second leading commodity, declined 14% during the same period.

Environment. The U.S. Environmental Protection Agency (EPA) announced that it would spend more than $250 million under Federal Superfund Authority to remove radium-contaminated soil around and under as many as 400 houses in Glen Ridge, Montclair, and West Orange. The radium was dumped early in the century by a factory that used the metal to make glow-in-the-dark watch faces. The total area to be treated covers 200 acres in the three towns. Under the plan, more than 324,000 cubic yards of dirt, or enough to fill 15,000 large dump trucks, will be removed. According to the EPA, the contaminated soil will be sent to an out-of-State dump. Currently, the only privately operated site accepting such material is Envirocare Inc. in Clive, UT. The project is expected to take 10 years.

Initial efforts were underway in Jersey City to clean up chromium-contaminated sites. The 148 identified sites were believed to have been contaminated by the use of chromium slag as fill and diking material by former chromate processing firms. The State is expected to seek reimbursement from the companies for any public dollars spent in the cleanup efforts. By yearend, at least two of the companies involved had already pledged $130 million for the cleanup.

Table 1.--Nonfuel mineral production in **New Jersey** 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- metric tons --	14,954	$368	18,492	$400	19,051	$400
Gem stones ----------	NA	3	NA	3	NA	3
Peat ---------- thousand short tons --	43	797	W	638	34	788
Sand and gravel:						
Construction ---------- do.--	18,318	74,183	e/15,200	e/68,400	13,000	61,500
Industrial ---------- do.--	1,860	25,437	1,797	26,138	1,925	29,045
Stone (crushed) ---------- do.--	e/ 3/19,300e/	3/123,500	20,799	140,998	18,500	131,700
Zircon concentrates ----- metric tons --	W	W	W	8,988	W	W
Combined value of clays (common), marl (greensand, 1988-89), stone (crushed limestone, 1988), and values indicated by symbol W ----------	XX	17,544	XX	3,318	XX	11,909
Total----------	XX	241,832	XX	248,883	XX	235,345

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; value included with "Combined value" figure.
3/Excludes certain stones; value included with "Combined value" figure.

Legislation and Government Programs. A number of bills involving environmental concerns were introduced in the State Legislature. These bills concerned radon gas exposure, recycling, and removal of toxic metals from soils near former metal refineries. At yearend, all the bills were still in committee, but may be reintroduced in the 1991 legislative session.

Review By Nonfuel Mineral Commodities. In response to citizens' complaints concerning a proposed new **sand and gravel** mining operation in Fairfield Township, the township committee adopted an ordinance that placed a moratorium on new mining applications and permits for a year. The moratorium applies to all land mining, earth, and resource extraction operations not legally in existence in the township as of April 10, 1990. Earlier in the year, Genstar Stone Products Inc., a Maryland-based firm, expressed interest in opening a sand mining operation on 300 acres the firm owns in the township.

One of the largest, most ambitious, and most expensive shoreline reclamation projects was being undertaken along 30 miles of the New Jersey shoreline from Monmouth Beach to Lavalette. In the initial stages of the $250 million project, 90,000 tons of rock and 23 million cubic yards of sand would be used. Both **dimension stone** and **crushed stone** would be obtained from quarries in New Jersey, as well as other East Coast States. The **sand** would be obtained by dredges and hydraulic pumps that would carry the sand from the ocean floor 1 miles offshore. Seawalls would be built or rebuilt and the pumped sand from offshore would create a beach at least 100 feet in width. The Federal government is committed to paying 65% of the project. State, county, and local sources have to pay the remaining 35%.

Ronson Metals Corp., Newark, which has produced **rare earth** metals for industrial use since 1915, ceased operations in July. The company indicated that it had incurred sizable losses in recent years with the decline of the U.S. steel industry. Ronson produced flints for lighters and also marketed mischmetal to the steel industry. Mischmetal, a natural mixture of the rare earth metals cerium, lanthanum, and didymium, is used as a metallurgical additive for desulfurizing steel and in zinc plating.

In August, the State's first historical mining museum was opened. The museum is located at the former Sterling Hill **zinc** mine in Ogdensburg. The Sterling Hill Mine, which closed in 1986, was the last working metal mine in the State. The new venture, called the Sterling Hill Mining Co., was formed not to mine ore, but to provide to the public, a complete display of this world famous mine's activities, equipment, and memorabilia.

NEW MEXICO

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Annual, Estimated

THE MINERAL INDUSTRY OF NEW MEXICO IN 1990

The U.S. Bureau of Mines estimated that the total value of nonfuel mineral production in New Mexico was about $1.1 billion in 1990. This amount reflected a decline from the previous year of almost 4% and was the first drop in value since 1986. The State fell to twelfth place in the output of nonfuel minerals.

The metals sector including copper, gold, molybdenum, silver, and zinc contributed nearly $750 million, or 69%, of the total value of nonfuel mineral production. Potash output furnished over 21% of the total value. In addition, New Mexico mines produced significant quantities of mica, perlite, sand and gravel, and stone.

Table 1 --Nonfuel mineral production1/ in New Mexico

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	28,555	$83	31,012	$94	30,306	$86
Copper2/ ---------- do --	258,660	687,182	259,432	748,939	W	W
Gem stones ----------	NA	200	NA	279	NA	279
Gold2/ ---------- kilograms --	W	W	1,076	13,231	W	W
Perlite ---------- short tons --	458,000	14,294	487,000	13,080	497,350	15,462
Potash ---------- thousand metric tons --	1,271	213,800	1,365	242,619	1,460	231,000
Pumice ---------- do --	76	852	77	795	W	W
Sand and gravel (construction) thousand short tons --	8,787	31,367	e/11,800	e/45,400	12,500	50,500
Stone:						
Crushed ---------- do.--	e/3,500	e/13,900	2,784	11,672	2,900	12,800
Dimension ---------- short tons --	e/21,893	e/626	W	W	W	W
Combined value of cement, gypsum, helium (Grade-A), iron ore (includes byproduct material), lead (1988-89), mica (scrap), molybdenum, salt, silver, zinc (1989-90), and values indicated by symbol W ----------	XX	60,368	XX	r/45,466	XX	767,911
Total----------	XX	1,022,672	XX	1,121,575	XX	1,078,038

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Recoverable content of ores, etc.

Environment. Phelps Dodge Corp. and the New Mexico Environmental Improvement Division (EID) reached an agreement over a release of water that occurred during the summer of 1988 at the company's mining operation near Hurley. Unusually heavy rainfall forced Chino Mines Co., a subsidiary of Phelps Dodge, to release stormwater runoff mixed with mine process water into Whitewater Creek. Terms of the agreement require Chino Mines to improve its water storage system at an estimated cost of $2.8 million and to contribute a total of $301,000 to the EID, New Mexico State University, and New Mexico Hazardous Waste Emergency Fund.

The national director of the Bureau of Land Management (BLM) rescinded the agency's earlier approval of a plan submitted by Molycorp Inc. to construct a new tailings pond on Guadalupe Mountain, northwest of the company's Questa Mine. The State office of the BLM was directed to write a supplement to the project's environmental impact statement because the original statement did not adequately assess alternative tailings sites. Officials estimated the new study will be completed in about 2 years. Molycorp originally proposed the Guadalupe site in 1982.

Molycorp announced its intention to repair the entire tailings pipeline from the Questa Mine in Red River Canyon to the tailings disposal area west of the town of Questa. The 27-mile pipeline will be replaced with rubber-lined pipe at an estimated cost of $3 million. Several tailings spills occurred during the year when weak sections of the pipeline ruptured, prompting the Environmental Protection Agency (EPA) to threaten the company with fines.

Despite objections by the local citizenry and members of the scientific community in Socorro, the EPA characterized the nearby abandoned Billing smelter site as hazardous and began remediation procedures shortly after midyear. Approximately $2 million was spent by September 30, 1990 removing several inches of contaminated soil from the area. Although the EPA asserted that the soil contained anomalous lead, scientists at the New Mexico Institute of Mining & Technology and the New Mexico Bureau of Mines and Mineral Resources contended that the lead, chemically fixed in the alkaline soil, was not bioavailable and therefore not hazardous.

Legislation and Government Programs. Most legislation introduced by the 1990 State legislature affecting the minerals industry was generally favorable. Two tax bills (HB-428 and SB-208) beneficial to mining interests were passed and signed by the Governor. Mine wastes were specifically excluded from the comprehensive solid waste management program enacted in Senate bill 2 by the legislature. At the urging of the mining industry, State funds that were to be cut from the New Mexico Transportation Authority, were restored.

The U.S. Congress passed legislation that protects a stretch of the East Fork of the Jemez River in Sandoval County from mining 1/4 mile on either side of its banks. Legislation, signed into law in June, designates the river as part of the National Wild and Scenic Rivers System. Although the right to locate minerals in the 11-mile strip of land is withdrawn and mining is prohibited, the Copar Pumice Co. will be allowed to mine on its property near the river since the company had valid claims prior to the legislation. In a move to prevent Copar from obtaining patent on its 1,700-acre parcel of mining claims, congressional hearings were held to consider additional legislation to create a National Recreation Area that would encompass the pumice property. Opponents, however, argued that this proposed legislation will have no effect on Copar's patent application since it has already been filed with the proper authorities.

A report summarizing the impact of government policies on extractive industries in the State was issued by the Mining and Minerals Division of the New Mexico Energy, Minerals and Natural Resources Department and the Institute for Public Policy of the University of New Mexico. In September, a conference of panelists convened to discuss the report and make recommendations in the principal areas of concern including community assistance, education, marketing, regulation, and taxation. Toward yearend, these recommendations were submitted to the State legislature.

In July, the Santa Fe County Board of Commissioners unanimously passed a moratorium on the acceptance of new applications for permits to explore and extract minerals on private lands. The 6-month moratorium was to be in effect from August 13, 1990, to February 9, 1991. During the interim, the Commission was to draft a new set of regulations governing mineral development in the County. Approval of the new regulations was scheduled for January 1991. Actions by the Commission were initially taken in response to complaints by a citizens' coalition that current regulations controlling the local minerals industry were inadequate.

During the year, the U.S. Bureau of Mines continued to investigate mineral deposits near the margin of the Great Plains in New Mexico. The study was conducted in conjunction with the New Mexico Bureau of Mines and Mineral Resources and the U.S. Geological Survey. A report on rare-earth

mineralization in the Laughlin Peak area (Colfax County) was completed toward yearend. Two other studies, begun in 1990 by the Bureau of Mines, were a mineral appraisal of the 14.5 million-acre Roswell Resource Area in southeastern New Mexico and the mineral resource evaluation of a 100,000-acre addition to the Carson National Forest in the northern part of the State.

Review by Nonfuel Mineral Commodities. New Mexico mines collectively ranked second in the Nation for their output of **copper** in 1990.

During the year, the Tyrone Mine and the Chino Mine owned by the Phelps Dodge Corp. continued as the Nation's third and fourth largest copper producers, respectively. A new 3-year contract, effective July 1, was approved by the union members at the Chino Mine. The contract provided wage increases and an improved medical plan. Late in the year, employees filed a petition with the National Labor Relations Board to decertify the unions at the Tyrone Mine. A report issued by the Western New Mexico University estimated that closure of the Tyrone Mine will decrease annual revenues to the Silver City area by about $21 million.

Several copper deposits in the State were examined and pronouncements made concerning their possible development. Cyprus Minerals Co. continued assessing the Continental property in Grant County and reviewed the potential for a joint venture agreement with the mine owner, Sharon Steel. Technical Mineral Services announced plans to mine a copper oxide deposit in the Deadman Canyon area of Grant County. The company planned to heap leach the ore and recover copper in a solvent extraction-electrowinning plant. The Copper Flat deposit in Sierra County was purchased during the year by the Gold Express Corp. This property, operated briefly in 1982 by Quintana Minerals, reportedly contains 53 million short tons of openpit ore at an average grade of 0.45 percent copper.

The value of **potash** mined in the Carlsbad area represented more than one fifth of the total nonfuel mineral production in New Mexico. Six subsurface mines increased their combined output approximately 7% over that of 1989. The total production accounted for nearly 90% of all U.S. output.

IMC Fertilizer Group announced that it had achieved a record potash production of more than 1 million short tons during its fiscal year ended
June 30. AMAX Inc. continued efforts to sell its potash operations during the year. Western-Ag Minerals negotiated a 3-year contract with union members. Representatives of the potash industry continued to urge the New Mexico Transportation Authority to create a regional transportation development district that could effectively address the industry's desire to have a shorter railroad connection to eastern markets.

In addition to copper, the other metals that were produced in significant quantities in the State were **molybdenum, gold, silver,** and **zinc**. Molycorp Inc. operated the underground Questa molybdenum mine for a full year following startup in late 1989. Most of New Mexico's gold and silver were produced as byproducts of base-metal production. Early in the year, Cyprus Minerals began recovering zinc concentrates at the Deming concentrator. The concentrator, leased from ASARCO Inc., was refurbished and a new tailings pond was constructed. Copper-zinc ore was produced by Cyprus at the Pinos Altos Mine and hauled by truck to Deming. St. Cloud Mining Co., a subsidiary of the Goldfield Corp., leased the Hanover open pit mine near Silver City from the Sharon Steel Corp. and began mining zinc in August. The ore was produced at the rate of about 400 short tons per day and taken to the company mill at Winston.

The value of New Mexico's industrial mineral production in 1990 was estimated to be about $329 million. Besides potash, other commodities that contributed significantly to the total value were **perlite, construction sand and gravel,** and **crushed stone**. The production of perlite was the largest in the Nation. New Mexico mines also produced important quantities of **mica** and **pumice**. The sole producer of mica in the State, Mineral Industrial Commodities of America Inc., was purchased at midyear by Franklin Industries. Plans were announced by the new owner to expand the mica plant at Velarde.

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NEW YORK

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Annual, Estimated

THE MINERAL INDUSTRY OF NEW YORK IN 1990

The value of nonfuel mineral production in New York in 1990 was estimated by the U.S. Bureau of Mines to be $737 million. This represents a decrease of $8 million from 1989, primarily the result of lower sales of construction sand and gravel, the State's fourth leading mineral commodity. Leading mineral commodities in terms of value were crushed stone, salt, cement, construction sand and gravel, zinc, and wollastonite. Other commodities produced included clays, garnet, gypsum, peat, byproduct lead and silver, and talc. New York was the only State that produced wollastonite. The State ranked 14th in value of nonfuel mineral production.

Table 1 --Nonfuel mineral production in New York 1/

Mineral	1988 Quantity	1988 Value (thousands)	1989 Quantity	1989 Value (thousands)	1990e/ Quantity	1990e/ Value (thousands)
Clays ---------- metric tons --	551,375	$3,654	531,599	$3,429	481,318	$3,258
Emery ---------- short tons --	W	W	--	--	NA	NA
Gem stones ----------	NA	200	NA	300	NA	350
Peat ---------- thousand short tons --	W	W	W	10	1	12
Salt ---------- do --	4,614	127,994	5,424	161,627	4,967	163,496
Sand and gravel:						
Construction ---------- do --	33,884	124,341	e/31,600	e/118,500	21,900	83,200
Industrial ---------- do --	53	625	53	633	50	540
Stone:						
Crushed ---------- do --	e/39,900	e/193,500	39,851	201,749	39,100	207,600
Dimension ---------- short tons --	e/30,751	e/4,333	23,756	3,979	23,437	3,589
Combined value of cement, garnet, gypsum, iron ore (includes byproduct material, 1988-89), lead, silver, talc and pyrophyllite, wollastonite, zinc, and values indicated by symbol W -------	XX	241,053	XX	255,495	XX	274,968
Total----------	XX	695,700	XX	745,988	XX	737,013

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Local opposition by residents to new mining permits and to expanding operations continued throughout the State. Other issues concerning noise, dust, truck traffic, and mine reclamation were often brought up at town meetings in order to prevent or restrict mining activities. Most of these complaints were directed at construction sand and gravel and crushed stone producers. In order to clearly define what roles the State and local governments should have in the regulation of mining and reclamation, three assembly bills were reintroduced in 1990 on this subject. At yearend, the bills

remained in committee. They may again be reintroduced in the 1991 legislative session.

Environment. Under a Department of Environmental Conservation consent order, Alcoa and Reynolds Metals Co. were developing and carrying out interim remedial measures to cleanup sediments tainted with polychlorinated biphenyls (PCB's) in the Saint Lawrence River System near Massena. It was alleged that Alcoa and Reynolds both used PCB-based hydraulic fluids during the operation of their primary aluminum smelters in Massena.

Legislation and Government Programs. Three assembly bills (A 1226, 4961, and 8040) were reintroduced into the 1990 Legislature. All three bills were intended to amend the environmental conservation law in relation to local regulations concerning the extractive mining industry. Although each bill differed slightly from the others, they were primarily written to determine what roles State and local governments should have in the regulation of mining and reclamation.

Local governments, zoning boards, environmental groups, and those who oppose mining generally favored A 1226 and A 4961, which would give more control to local communities to regulate mining. A 8040 was primarily drafted by the New York State Department of Environmental Conservation (DEC), the State agency that currently regulates mining and reclamation in the State. H.B. 8040 would give total control of regulation to the State, but would permit towns to still zone lands within their communities. The Empire State Concrete and Aggregate Producers Association Inc., which represents the aggregate mining industry in New York, is opposed to A 1226 and A 4961 and favors the A 8040. At yearend, the bills were still in committee. They may be addressed again in the 1991 legislative session.

In July, a law setting the limits on the amounts of lead, mercury, cadmium, and hexavalent chromium in packages and packaging components was signed. The legislation, which is scheduled to take effect in January 1992, bans the use of heavy metals in inks, dyes, pigments, adhesives, stabilizers, and other additives in excess of the following concentration levels: 600 ppm by weight, effective January 1992; 250 ppm, effective January 1993; and 100 ppm, effective January 1994. Although sponsors of the bill indicated that metals as packaging components were generally safe for intended use, they would nevertheless be harmful to the environment when landfilled or incinerated.

Review By Nonfuel Mineral Commodities. In late November, operations at Akzo's Retsof **salt** mine in Livingston County were temporarily suspended after a massive roof fall killed two miners and injured a third. Inspectors from the U.S. Department of Labor, Mine Safety and Health Administration, investigated the accident. The Retsof Mine is the world's largest producer of rock salt, primarily for highway usage.

Despite opposition from the Town Board, the Adirondack Park Agency (APA) approved a proposal to mine a black **granite** from 3 acres in Dresden, inside the park boundary. Orex, the company that wants to quarry the site, was also proposing to construct a stone processing plant in Whitehall, just outside the Adirondack Park boundary. In addition to APA approval, Orex must obtain necessary mining permits from the New York State Department of Environmental Conservation.

In late 1989, the Engelhard Corp. agreed in principal to purchase NYCO, which operated one of two **wollastonite** operations in the State. At yearend, however, Engelhard announced that they would not go through with the purchase due to undisclosed reasons.

In the town of Amherst, developers were proposing to build a large residential and commercial project on a 288-acre site. However, a large portion of the area is believed to be over abandoned **gypsum** mines, which could potentially pose subsidence problems. The magnitude and the exact locations of the mines' workings are not accurately known since there are no reliable and accurate maps that show the mines' extent. During the year, personnel at the Bureau of Mines, the Office of Surface Mining Reclamation and Enforcement, and the New York Geological Survey were contacted to help determine the mines' borders and evaluate the mines' subsidence potential.

NORTH CAROLINA

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Annual, Estimated

THE MINERAL INDUSTRY OF NORTH CAROLINA IN 1990

Statistics released by the U.S. Bureau of Mines indicate that the 1990 estimated value of minerals produced in North Carolina decreased slightly from that of 1989. The decrease was 0.6% as the value dropped from $581.6 million to $578.4 million. The decrease marked the first time in 8 years that North Carolina's mineral value failed to increase to a record high. The decrease supported evidence that the State's economy was entering a recession.

Significant increases in the value of stone and construction sand and gravel were offset by declines in the value of feldspar, industrial sand and gravel, lithium minerals, olivine, phosphate rock, and pyrophyllite which, compared with 1989, fell 14%. The increased value of crushed stone and construction sand and gravel produced was attributable to North Carolina's accelerated intrastate highway construction program that went into effect in 1990. The increase in crushed stone and construction sand and gravel, however, was not as great as anticipated because revenues from the gasoline taxes that finance the program fell short of projections. The life of the program, which was originally scheduled to be completed in 13-1/2 years, has been extended to 16 or 17 years because reduced revenues from the gasoline tax. An increase of over 10% in the value of dimension stone was largely the result of the use of North Carolina granite to replace the Italian marble facing on the Amoco Building in Chicago.

North Carolina continued to lead the nation in the quantity and value of lithium minerals, scrap mica, olivine, and pyrophyllite produced. The State also led the Nation in the production of clay used for the manufacture of bricks and ranked second in the quantity of common clay mined. Overall, North Carolina ranked 19th in the value of all mineral commodities produced.

Exploration. Exploration of ancient beach sands containing titanium-rich heavy minerals intensified during the year with at least 10 companies reported active. Southeast Tisand Co., a joint venture of Becker Minerals Inc. (U.K.) and Consolidated Rutile Ltd. (Australia), announced plans to develop a prospect near Roanoke Rapids. During the year, it continued exploratory and development drilling, conducted pilot plant studies in conjunction with the North Carolina Minerals Research Laboratory, and began work on an application for a mining permit.

RGC (USA) Minerals Inc., a subsidiary of Renison Goldfields Consolidated Inc. (Australia), also revealed plans to mine property it had leased in the Aurelian Springs area.

Table 1.--Nonfuel mineral production in North Carolina 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	2,880,193	$16,349	2,270,384	$15,529	2,318,899	$15,907
Feldspar ---------- short tons --	507,986	17,312	480,436	14,024	463,684	14,221
Gem stones ----------	NA	688	NA	784	NA	784
Mica (scrap) --- thousand metric tons --	79	4,512	73	4,192	72	4,242
Peat ---------- thousand short tons --	21	W	W	W	W	138
Sand and gravel:						
Construction --- thousand short tons --	11,076	38,459	e/11,200	e/43,700	12,500	51,200
Industrial ---------- do. --	1,246	15,953	1,627	19,902	1,685	18,610
Stone:						
Crushed ---------- do. --	e/50,500	e/250,000	51,519	257,976	52,500	276,200
Dimension ---------- short tons --	e/31,977	e/5,026	62,665	10,477	66,531	11,551
Combined value of lithium minerals, olivine, phosphate rock, talc and pyrophyllite, and values indicated by symbol W ----------	XX	181,135	XX	214,984	XX	185,508
Total----------	XX	529,434	XX	581,568	XX	578,361

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Environment. The North Carolina Low-Level Radioactive Waste Management Authority selected Chem-Nuclear Systems Inc. of Columbia, SC, to design, build, and operate a low-level radioactive waste facility. The final site for the facility will be chosen from sites being studied in Richmond County and on the Wake-Chatham County line. The facility is to be operational by December 31, 1991, according to an agreement signed in 1985 by members of the eight-State Southeast Compact.

It appeared that the Hazardous Waste Management Commission (HWMC) would have a difficult time meeting a December 31, 1991, deadline to have a hazardous waste incinerator, solvent recycling center, and landfill operational. In December, the North Carolina Council of State rejected the site in Granville County that HWMC had selected for the facility. North Carolina agreed to build the facility as part of a five-State agreement to allow free shipment and disposal of hazardous waste between the States. As a result of the site rejection which made it impossible for North Carolina to meet a December 31, 1990, deadline for submitting construction and environmental permit applications, the States of Alabama and South Carolina announced that they would not accept hazardous waste from North Carolina beginning January 1, 1991.

Carolina Solite Co., a Stanly County light-weight aggregate producer, resumed burning hazardous wastes in late November. The company had converted to coal to fuel its burners three months earlier to placate local residents and environmentalists who expressed concern over potential health problems. Company officials indicated Solite resumed burning the hazardous waste after receiving a report from the N.C. Division of Environmental Management report that indicated emissions from the plant did not harm the environment. However, the possibility that Solite would lose its permit to burn hazardous waste on December 1, 1990, because it had converted to coal appeared to be the principal reason for the change.

Legislation and Government Programs. Two bills affecting the minerals industry where enacted in 1990. One bill increased criminal penalties for certain environmental violations, while the second established mining permit application and modification fees. A bill that would have repealed sections of existing legislation requiring that environmental rules be no more restrictive than comparable Federal regulations died in committee.

Review by Nonfuel Mineral Commodities. **Crushed stone**, valued at over $276.2 million and accounting for 48.8% of the total value of mineral production, was the leading mineral commodity produced in North Carolina. Developments affecting the crushed stone industry were related mainly to opposition by local residents and environmental groups to applications for zoning or mining permits for new quarries or for expansion of existing quarries.

Phosphate rock, mined by Texasgulf Inc. in Beaufort County, and **lithium minerals**, mined in the Kings Mountain area of Gaston and Cleveland Counties, were the next most valuable mineral commodities mined. Data on the quantity and value of these commodities are proprietary and must be withheld. The major lithium producer in the State announced a name change from Lithium Corporation of America to Lithium Division, FMC Corp.

North Carolina continued to rank fourth nationally in the quantity of **clay** mined. Two types of clay, **common clay and shale**, and **kaolin** were produced. The kaolin was produced as a byproduct of **feldspar** and **mica** operations in Avery and Cleveland Counties. Other mineral commodities produced in 1990 included **gem stones, peat, industrial sand and gravel, dimension stone, olivine**, and **pyrophyllite**. With the exception of dimension stone, which increased by 10.3% in value, all of the preceding group of minerals either decreased or gained only slightly.

Other developments affecting the mineral industry included the announcement that Unimin Corp., the State's third largest feldspar producer, had purchased the second larger producer, Indusmin Inc. Unimin subsequently sold Indusmin's two feldspar mines and processing plant located near Spruce Pine to Hecla Mining Co. of Coeur d'Alene, Idaho. North Carolina's largest feldspar producer, The Feldspar Corp., announced that its parent company, Zemex Corp., had moved its corporate headquarters from New York City to Asheville. J.M. Huber Corp. announced plans to sell its mica operations at Spruce Pine and at Kings Mountain by yearend.

NORTH DAKOTA

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Annual, Estimated

THE MINERAL INDUSTRY OF NORTH DAKOTA IN 1990

The value of North Dakota's nonfuel mineral production was nearly $21 million in 1990, an increase of about 50% over that of 1989, according to estimates by the U.S. Bureau of Mines. The State ranked 48th, nationally, in nonfuel mineral production, accounting for less than 1% of the U.S. total. Construction sand and gravel accounted for slightly more than one-half of the value of North Dakota's nonfuel mineral output. Other commodities produced, in order of decreasing value, included lime, crushed stone, clays, peat, and gem stones. Elemental sulfur was recovered from natural gas processing. Most of the State's nonfuel mineral production was used in construction. Nonfuel mining employment fell 27%, or a loss of 150 jobs, down to 400 jobs Statewide in October 1990, compared with October 1989 employment.

The North Dakota Lignite Council estimated 1990 lignite coal production in the State to be 29.5 million short tons, unchanged from the 1989 production level. North Dakota's lignite coal resources are estimated at about 350 billion tons.

Table 1 --Nonfuel mineral production in North Dakota 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	76,918	$147	47,903	W	54,431	W
Gem stones ----------	NA	2	NA	$10	NA	10
Lime ---------- thousand short tons --	108	7,094	107	5,439	107	5,439
Peat ---------- do --	W	W	W	W	1	W
Sand and gravel (construction) --- do --	3,772	8,079	e/3,600	e/8,100	5,000	10,400
Stone (crushed) ---------- do --	2/ e/--	2/ e/--	--	--	1,000	4,600
Combined value of other industrial minerals and values indicated by symbol W ----------	XX	3,485	XX	111	XX	(3)
Total----------	XX	18,907	XX	13,660	XX	4/20,449

e/Estimated. NA Not available. XX Not applicable. W Withheld to avoid disclosing company proprietary data.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes crushed miscellaneous stones, value included with "combined value" figure.
3/Value excluded to avoid disclosing company proprietary data.
4/Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

Legislation and Government Programs. Researchers at the University of North Dakota's Combustion and Environmental Systems Research Institute secured $500,000 in Federal and private industry funding to develop its patented process to remove ash from power plant emissions. The flue-gas conditioning process reportedly can remove nearly 100% of all ash emissions from coal-burning power

plants. In the process, anhydrous ammonia and anhydrous sulfuric acid are injected into the smokestack emissions or flue gas. The resultant chemical reaction creates ammonium sulfate which coats the surface of fine ash particles, thereby making them easier to collect on filters.

Review by Nonfuel Mineral Commodities. **Construction sand and gravel** production was up about 39%, and value increased 28%. **Clay** production and value increased nearly 14% and 31%, respectively. **Lime** production and value were estimated to have remained at the same level as in 1989.

OHIO

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Annual, Estimated

THE MINERAL INDUSTRY OF OHIO IN 1990

The value of nonfuel mineral production in Ohio in 1990 was $723 million, according to estimated data compiled by the U.S. Bureau of Mines. Output of the State's two leading mineral commodities, crushed stone and sand and gravel, remained about the same as in 1989. Production of these two commodities, used extensively in construction, accounted for about $350 million or nearly one-half the State's total value of mineral production. Nationally, Ohio ranked 15th in the value of nonfuel mineral output.

While demand for industrial minerals in Ohio remained stable during the past 4 years, coal production continued to decline. Output of about 31 million short tons of coal in 1990 was 10 million tons less than in 1980. Nationally, during that same time period, coal production has increased by about 25%.

Table 1 --Nonfuel mineral production in Ohio 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry ---------- thousand short tons --	129	$11,140	128	$11,233	130	$11,600
Portland ---------- do. --	1,424	70,816	1,446	73,230	1,500	76,500
Clays ---------- metric tons --	3,365,164	14,423	2,519,668	14,983	2,412,280	17,354
Gem stones ----------	NA	10	NA	18	NA	18
Lime ---------- thousand short tons --	2,065	87,431	1,888	94,157	1,909	95,202
Peat ---------- do. --	W	W	8	182	7	183
Salt ---------- do. --	3,795	115,860	W	W	W	W
Sand and gravel:						
Construction ---------- do. --	46,104	156,318	e/44,400	e/148,700	46,400	157,800
Industrial ---------- do. --	1,361	23,441	1,394	24,662	1,455	24,180
Stone:						
Crushed ---------- do. --	e/48,000	e/252,000	46,426	183,190	45,900	190,900
Dimension ---------- short tons --	e/38,300	e/3,137	59,923	3,455	61,783	3,468
Combined value of other industrial minerals ----------	XX	2,676	XX	145,346	XX	145,415
Total ----------	XX	737,252	XX	699,156	XX	722,620

e/Estimated. NA Not available. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Environment. Throughout the year, investigations involving toxic waste and pollution were prevalent. A trend toward stricter regulation and more aggressive enforcement in all areas of Ohio's environmental protection system continued, according to a report by the State Environmental Law Compliance Center of Government Institutes Inc. One indication of the growth in environmental matters

was the increase in employment at the Ohio Environmental Protection Agency (OEPA). In 1990, OEPA employed more than 1,000 workers, an increase of about 400 employees since 1987.

During the year, the U.S. Environmental Protection Agency and the Department of Energy agreed to pay $1 billion to clean up radioactive waste at a closed uranium processing plant. The OEPA and U.S. EPA were monitoring cleanup work at the 1,000-acre plant site about 20 miles northwest of Cincinnati.

In the Ohio Legislature, House bill 925 was introduced requiring stricter regulations for hazardous-waste, deep-well, injection sites. Among the provisions in the bill were authorization for rules on seismic monitoring around injection wells, annual licensing for all injection-well operations, and public hearings on every new or renewal permit for hazardous-waste cases. Projects were also underway aimed at reusing mineral waste products, as well as developing technology to lower the use of raw materials used in manufacturing. Norfolk Southern Corp. announced in November a proposal to construct a $30 million plant to produce charcoal-type briquettes from a mixture of municipal waste and low-volatile coal ash. In addition to the manufacture of briquettes, aluminum and ferrous metals would be reclaimed and recycled, and a byproduct material compatible for use in surface coal mine reclamation work produced.

Eltech Research Corp. received about $750,000 from the U.S. Department of Energy to develop a more energy-efficient way to manufacture aluminum. The company was conducting experiments with ceramic anodes, which were expected to last up to three times longer than the carbon anodes currently used.

Review By Nonfuel Mineral Commodities. Strong demand by the construction industry for **crushed stone** and **sand and gravel** continued in 1990. Beginning in 1988, the combined production of these two commodities surpassed 90 million short tons for the first time since 1979. That trend continued through 1990 as output totaled 92.3 million short tons. Nationally, Ohio ranked 4th in sand and gravel production and 10th in crushed stone production. Ohio was also among the United States' top producers of **lime**, ranking 2d; of **common clay**, ranking 3d; and of **salt**, ranking 4th.

OKLAHOMA

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Annual, Estimated

THE MINERAL INDUSTRY OF OKLAHOMA IN 1990

The value of nonfuel mineral production in Oklahoma was estimated at $237 million by the U. S. Bureau of Mines. This was an $18 million increase over the 1989 figure. Increased demand for and sales of cement, iodine, and crushed stone offset a decline in construction sand and gravel sales. Oklahoma continued to rank 35th nationally in total mineral value and was the only State with iodine production. The 1990 estimated mineral value reversed a 4-year trend of decreasing value. Sales, however, remained several million dollars below the record $251.6 established in 1985.

Table 1 --Nonfuel mineral production in Oklahoma 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement (portland) thousand short tons --	1,432	$42,131	1,236	$39,360	1,400	$44,800
Clays ---------- metric tons --	684,067	1,803	565,956	1,619	596,686	1,796
Gem stones ----------	NA	18	NA	W	NA	W
Gypsum ---------- thousand short tons --	2,173	13,393	2,523	14,369	2,578	15,120
Iodine ---------- kilograms --	1,015,210	W	1,505,714	23,947	1,861,500	29,325
Sand and gravel:						
Construction --- thousand short tons --	9,273	22,654	e/8,500	e/20,000	7,100	16,900
Industrial ---------- do --	1,268	17,381	1,216	18,310	1,195	19,370
Stone:						
Crushed2/ ---------- do --	e/26,300	e/92,000	23,598	81,969	22,600	89,500
Dimension ---------- short tons --	e/7,746	e/785	8,290	762	8,138	684
Combined value of cement (masonry), feldspar, lime, salt, (1988), stone [crushed dolomite, (1988), crushed granite, (1989-90)], tripoli (1988-89), and values indicated by symbol W ------	XX	29,972	XX	18,695	XX	20,006
Total----------	XX	220,137	XX	219,031	XX	237,201

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain stones; kind and value included with "Combined value" figure.

Employment. Mining employment for the first six months of 1990, including oil and gas extraction, averaged 44,400. This was a 4% increase over the same period in 1989. Total State employment for the same period rose only 2.1%.

Environment. A task force appointed by the Governor reported that the State's environmental regulation agencies were fragmented and should be consolidated. However, legislation that would have consolidated a number of State agencies, including the Department of Mines, died in the 1990 Appropriations Subcommittee in the Oklahoma House of Representatives.

Personnel at the Sequoyah Fuels Corp., a uranium processing plant at Gore, discovered extremely high uranium concentrations in water samples when storage tanks were excavated. Contamination also was noted at other sites on the plant property, but there was no indication that off-site water had been affected.

Legislation and Government Programs. The 1990 Oklahoma legislature passed and the Governor signed Senate Bill 263 which defined and regulated brine production.

The former U.S. Bureau of Mines helium plant in Boise City was deeded to the town of Keys, the city of Boise City, and Cimarron County. The plant terminated helium extraction from natural gas wells in the Keys field in 1981 and was completely closed in 1985.

Review by Nonfuel Mineral Commodity. The three leading mineral commodities, in terms of value, were **crushed stone**, **portland cement**, and **iodine**. These three accounted for 69% of the total mineral value. This was a 3% increase over the 1989 value reported for the three commodities.

The community of Gore became the center of controversy surrounding State permits granted to two **limestone** mining firms, Allied Mining Corp. of Stillwell and Brazil Creek Minerals of Fort Smith. The public was concerned over possible noise, dust, and blasting issues, as well as the potential for increased truck traffic and road damage. A citizens group, The Save the Lower Illinois Inc., was formed to fight the limestone mines.

Creta Gypsum Inc., Olustee, applied for a surface mining permit in Jackson County. The firm sought the necessary permits to develop a surface mine to recover **gypsum**.

The internationally renowned Frankoma Pottery was seized by the Internal Revenue Service early in April because of a tax issue. The pottery reopened a few weeks later under Federal bankruptcy court protection. A fire in 1983 closed the company for a year and resulted in the loss of key sales personnel and customers. The pottery company has struggled financially since the fire.

OREGON

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Annual, Estimated

THE MINERAL INDUSTRY OF OREGON IN 1990

The estimated value of Oregon's nonfuel mineral production in 1990 rose to $220.6 million, an increase of nearly 19% from 1989, according to the U.S. Bureau of Mines. Gains in the production value of portland cement, nickel, and crushed stone, were largely responsible for the increase. The State's 1990 nonfuel mineral production value ranked 37th in the Nation, up from 38th in 1989. Industrial minerals accounted for the bulk of the State's total production value. Oregon was the Nation's sole producer of nickel. The State ranked first nationally in the quantity of pumice produced, third in diatomite production, and was a significant producer of processed natural zeolites.

Construction materials continued to be the most valuable minerals produced, accounting for more than 75% of the State's total mineral production value. Nickel and gold were the only metals produced in significant quantity. Nickel had the largest reported increase in both absolute value and percentage gain of all Oregon minerals, a result of the first full year of production at Glenbrook Nickel Co.'s newly reactivated plant near Riddle, Douglas County.

Table 1.--Nonfuel mineral production in Oregon 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	225,001	$1,049	210,893	$875	214,897	$1,095
Gem stones ----------	NA	894	NA	1,384	NA	1,384
Nickel (content of alloys) short tons --	--	--	383	2,600	W	W
Sand and gravel (construction) thousand short tons --	14,880	92,687	e/14,400	e/49,700	12,400	44,900
Stone (crushed) ---------- do. --	e/22,200	e/77,600	2/18,497	2/61,204	18,700	86,600
Talc and pyrophyllite --- metric tons --	W	W	204	18	W	W
Combined value of cement [masonry, (1988-89), portland], diatomite, gold, lime, pumice, silver (1988-89), stone [crushed dolomite and quartzite, (1989-90)], and values indicated by symbol W ----------	XX	45,988	XX	49,854	XX	86,710
Total----------	XX	178,188	XX	185,555	XX	220,609

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain stones; kind and value included with "Combined value" data.

Exploration. Exploration for precious metals continued at a high level in eastern Oregon, especially Malheur County. Plexus Resources Corp. completed a drilling program at its Bornite copper-

gold-silver project about 45 miles east of Salem in the North Sanitiam mining district, Marion County. The company was in the process of preparing mining permit applications for the U.S. Forest Service and Oregon authorities. Plexus acquired the property from Cyprus Minerals Exploration Co. in 1989.

Wavecrest Resources Inc., a subsidiary of Quartz Mountain Gold Corp., announced a development schedule for its Quartz Mountain gold prospect, 33 miles west of Lakeview in Lake County. The property contains the Crone Hill and Quartz Butte deposits and associated underground feeder veins. Exploration and development work, including extensive environmental studies, progressed under the direction of Pegasus Gold Inc., operating partner of both the Quartz Mountain property and the nearby Angel Camp deposit. The low-grade heap-leach project would initially concentrate on an oxide ore zone, followed by possible development of a large disseminated sulphide resource.

Chevron Resources Co. continued exploration and began collection of baseline date on its Hope Butte gold project in Malheur County. Also in Malheur County, Chevron drilled its Jessie Page (Quartz Mountain) property and applied for an exploration permit for its Mahogany project.

In an effort to earn a 51% interest in the projects, Billiton Minerals USA funded a drilling program on Ican Minerals' Racey gold property, Malheur County, and agreed to an exploration and development program with Beaver Resources at its Shasta Gold property.

Work was done at Manville Corp.'s Katey prospect, American Copper and Nickel drilled its prospect in Harper Basin, and Malheur Mining continued to explore its Kerby prospect near Farwell Bend. South of Farwell Bend, both Malheur Mining and Atlas Corp. located claims on Tub Mountain.

Cominco American Resources Ltd. acquired an option on Savanna Resources' Turner Albright copper-zinc-gold property. Cominco American can earn a 50% interest by completing an exploration and development program. Earlier in the year, Aur Resources decided not to exercise its rights to a similar option.

Environment. Ash Grove Cement West Inc. was seeking a conditional use permit to burn shredded tires as fuel at its cement plant at Durkee, Baker County. The Oregon Department of Environmental Quality had issued a permit, but the decision was later overturned by the State Land Use Board of Appeals. Opponents believed Ash Grove's stacks may spew toxic chemicals. Ash Grove claimed that burning shredded tires would conserve fossil fuels, aid in the disposal of two million tires discarded annually in Oregon, and keep the company competitive in the marketplace. A vote by Baker County residents in 1989 prohibited Ash Grove from firing its kilns with industrial waste, including commercial solvents, degreasers, and paints.

Legislation and Government Programs. Federal and State government and private company officials joined together to launch the "Oregon Metals Initiative," a $2 million research program to aid development of Oregon's metals industry. The initiative was being supported by $1 million in funding from the U.S. Bureau of Mines, $500,000 from Oregon's Strategic Reserve Fund, which is financed by the State Lottery, and $500,000 from the metals industry. The first round of research projects was to be carried out by Oregon State University and the Oregon Graduate Institute. Goals of the program are to find solutions to technical problems in processing, increase Oregon's pool of research talent, and improve the industry's long-term competitive position.

Review by Nonfuel Mineral Commodities. **Crushed stone** and **sand and gravel** for use in construction were produced from many pits and quarries throughout the State. The counties of Baker, Benton, Lane, Multnomah, and Washington were the State's leading crushed stone producers. Reflecting the predominantly volcanic nature of the State's geology, most of Oregon's crushed stone was trap rock (basalt). Major sand and gravel producing counties were Clackamas, Lane, Marion, and Multnomah. **Silica sand** for industrial use was produced by CooSand Corp. from dune sands on the north shore of Coos Bay, Coos County. Glenbrook Nickel used crushed quartz from the Quartz Mountain Mine, Douglas

County, at its nickel smelting operation at Riddle. Bristol Silica and Limestone Co. produced crushed and screened quartz at its Jackson County quarry.

Ash Grove Cement West Inc., the State's sole **cement** producer, operated a cement plant near Durkee, the first dry-process cement plant in the Pacific Northwest. The company also produced crushed and screened **limestone** from a quarry in Baker County. Other limestone production came from Jones Marble quarry, Josephine County, owned by Campman Calcite Co., and the D and D Ag Lime and Rock Co. quarry, Douglas County.

Quicklime accounted for the bulk of Oregon's **lime** production. Ash Grove Cement produced hydrated lime at a kiln in Portland. At its plant in Nyssa, Amalgamated Sugar produced quicklime and used it as "sugar rock" during the processing of beet sugar.

Eagle-Picher Industries mined **diatomite** at a surface operation along the Malheur-Harney County line and operated its Celatom diatomite processing facility west of Vale, Malheur County. Oil-Dri Production Co. operated an open pit and processing facility in Christmas Valley, Lake County.

Cascade Pumice Co. and Central Oregon Pumice Co. produced **pumice** from open pit mines and operated crushing and screening plants in the Bend area, Deschutes County. Teague Mineral Products Co. was the State's largest producer of **bentonite clay**, and the only company to mine a natural **zeolite** product. The Teague plant, near Adrian, was fed by several deposits in northern Malheur County and southwest Idaho. **Common clay**, used chiefly in bricks, ceramic tile, and cement, was mined by three companies in Baker, Josephine, Klamath, Lane and Multnomah Counties. Steatite of Southern Oregon Inc. produced **talc** (soapstone) from deposits in the Klamath Mountains at the southern edge of Jackson County.

The Glenbrook Nickel Co. **nickel** smelter near Riddle, Douglas County, had its first full year of production after being reactivated in 1989 as a joint venture of Cominco American Resources and USA Investments. The plant processed the screened low-grade laterite stockpile that was left at the site when Hanna Mining Co. closed the Nickel Mountain Mine and smelter in 1987.

Known **gold** production came mainly from small placer mines in southwestern and northeastern parts of the State. The Bonnanza Mine, a placer gold operation on Pine Creek near Halfway, Baker County, was the State's major producer. Atlas Corp. completed an economic feasibility study and prepared a plan of operation for its Grassy Mountain gold property in Malheur County. The company expected permitting and development to be completed in early 1993 and the mine to begin at that time its projected eight year production life. Silver also will be recovered as part of the gold-extraction process.

Formosa Exploration Inc. received an operating permit for its Silver Peak **copper-zinc** property in Douglas County. Construction began on the mill building and tailings pond, and essential mill equipment was in place. Reportedly, Silver Peak would be the first permitted underground mine to go into production in Oregon since World War II. Copper and zinc concentrates are to be sent to a smelter in Japan for further processing.

PENNSYLVANIA

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Annual, Estimated

THE MINERAL INDUSTRY OF PENNSYLVANIA IN 1990

The value of nonfuel mineral production in Pennsylvania in 1990 again exceeded $1 billion, according to estimated data compiled by the U.S. Bureau of Mines. The value of Pennsylvania's mineral production was the 11th highest in the United States.

For the fourth year in a row, the State produced minerals at a rate that resulted in more than $1 billion in value of production. That trend in value matched one in production of crushed stone. Beginning in 1987, Pennsylvania became the country's leading producer of crushed stone setting an all-time national record with output of 97.2 million short tons. It was also the first year in State history in which production of crushed stone surpassed that of coal.

Table 1 --Nonfuel mineral production in Pennsylvania 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry ---------- thousand short tons --	391	$28 713	349	$26 473	340	$25 900
Portland ---------- do --	6 309	329 634	5 757	301 980	5 900	312 700
Clays2/ ---------- metric tons --	1 248 139	5 843	1 049 973	4 936	1 158 995	4 957
Gem stones ----------	NA	5	NA	5	NA	5
Lime ---------- thousand short tons --	1 641	91 214	1 660	92 139	1 720	95 477
Peat ---------- do --	21	736	20	746	15	524
Sand and gravel (construction) --- do --	19 836	91 986	e/19 500	e/94 600	22 700	115 500
Stone:						
Crushed ---------- do --	e/104 600	e/470 700	3/93 123	3/455 004	3/97 300	3/502 700
Dimension ---------- short tons --	e/59 022	e/9 584	44 267	10 032	43 952	9 898
Combined value of clays (kaolin), mica (scrap), sand and gravel (industrial), stone (crushed granite, 1989-90, tripoli (1987-88), and value indicated by symbol W ----------	XX	14 098	XX	14 754	XX	15 495
Total----------	XX	1 042 493	XX	1 000 669	XX	1 083 156

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Excludes certain stones; kind and value included with "Combined value" figure.

Pennsylvania also became the first State ever to produce more than 100 million tons of crushed stone in 1988 when output of 104.6 million tons was reported by the State's producers. In 1990, Pennsylvania led the Nation in crushed stone production with output of 97.3 million tons valued at more than $500 million or about one-half of the State's total value.

Legislation and Government Programs. Commemoration of the 20th anniversary of Earth Day in April coincided with the introduction of legislation on environmental protection. Senate bill 814 provided for a $5 million remining fund for use in mining coal from previously abandoned mines. Three

bills were introduced relating to wetlands protection that would create programs for the State to purchase wetlands; to provide compensation if a court finds an owner has lost property because of wetlands designation; and to streamline the wetlands permitting process. These bills were carried over for action in the 1991 legislative session.

Review By Nonfuel Mineral Commodities. In addition to ranking first in the Nation in **crushed stone** production, Pennsylvania was among the top 15 States in output of every major mineral commodity produced in the State. Pennsylvania's position in output of other minerals in 1990 was as follows: **Masonry cement**, 2nd; **portland cement** and **lime**, 9th; **dimension stone**, 11th; and **construction sand and gravel**, 13th.

The State ranked fourth in coal production with about 70 million tons, according to projected data reported by the Energy Information Administration. Through the first three quarters of the year, Pennsylvania produced about 9 million tons of steel, which was nearly 450,000 tons less than the total for the same period in 1989. The State remained the third leading **steel**-producing State in the Nation.

PUERTO RICO

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Annual, Estimated

THE MINERAL INDUSTRY OF PUERTO RICO IN 1990

Statistics compiled by the U.S. Bureau of Mines indicate that the 1990 estimated value of nonfuel mineral commodities produced in Puerto Rico decreased from that of 1989. Data for crushed stone and industrial sand and gravel were not included in the 1990 estimates.

Table 1 --Nonfuel mineral production in Puerto Rico 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement (portland) thousand short tons --	1,397	$113,966	1,374	$112,318	1,100	$90,200
Clays ---------- metric tons --	148,218	365	136,873	311	133,175	402
Lime ---------- thousand short tons --	25	3,802	26	3,900	28	4,090
Salt ---------- do. --	40	900	--	--	--	--
Sand and gravel (industrial) ----- do. --	31	624	30	600	--	--
Stone (crushed) ---------- do. --	e/9,350	e/47,400	8,389	46,648	--	--
Total2/ ----------	XX	167,057	XX	163,677	XX	94,692

e/Estimated. -- Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Total does not include value of items withheld.

Environment. The Puerto Rico Environmental Quality Board amended the 1983 Water Quality Standards Regulation. The amendments mandated stricter and more complex environmental regulations, especially with respect to water, air, and solid waste.

Review by Nonfuel Mineral Commodities. The highest value nonfuel mineral commodity produced in Puerto Rico once again was **cement**. The estimated total value of cement produced in 1990 declined 19.9%, from $112.3 million to $90.2 million. Cement production was strong for the first third of 1990 as a result of construction activity financed by $881 million of Federal disaster relief given to Puerto Rico in the wake of Hurricane Hugo. This money was largely distributed by the end of April, after which construction activity and the consequent use of cement plummeted sharply.

Clay output fell 2.7%, but value increased 29%. All Puerto Rico clay production reported to the Bureau of Mines was used in the manufacture of cement.

Lime increased both in estimated tonnage and value by 7.7% and 7.6%, respectively, over the 1989 level.

RHODE ISLAND

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Annual, Estimated

THE MINERAL INDUSTRY OF RHODE ISLAND IN 1990

The value of nonfuel mineral production in Rhode Island in 1990 was estimated by the U.S. Bureau of Mines to be $12 million, nearly the same as in 1989. Crushed stone and construction sand and gravel accounted for virtually all of the State's production. A small amount of industrial sand was also mined.

Rhode Island's economy, like that of most of the other New England States, remained in a depressed state. The residential sector was overbuilt and only a limited amount of commercial and industrial construction was underway. Also, because of a lack of State and Federal funds available, highway and infrastructure work was at a virtual standstill. Because most of the State's mineral output is dependent on construction activities, these declines in building contracts had a corresponding effect on mineral producers. During the 1989-90 period, the value of aggregate sales (construction sand and gravel and crushed stone) declined by nearly a third from the peak years of 1987-88 when building activity was strongest. During the 1987-88 period, aggregate sales averaged nearly $18 million per year. In 1989-90, these same aggregate sales were down to an average of nearly $12 million per year. As a result of the slump in demand, many producers were forced to lay off workers.

Table 1 --Nonfuel mineral production in Rhode Island 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$1	NA	$2	NA	$2
Sand and gravel (construction) thousand short tons	1,853	7,847	e/1,100	e/3,900	1,000	3,700
Stone (crushed) do	e/1,500	e/9,400	2/1,208	7,170	2/1,400	8,700
Total3/	XX	17,248	XX	11,072	XX	12,402

e/Estimated. NA Not available. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes crushed traprock.
3/Partial total, excludes values which must be concealed to avoid disclosing company proprietary data.

Environment. Coventry Sand & Gravel and D'Ambra Construction Co. Inc. applied for permits from the Rhode Island Department of Environmental Management to allow the companies to accept and treat soil contaminated with petroleum products. The contaminated soil would come from areas around

underground storage tanks that have leaked and in much smaller quantities from transportation accidents. D'Ambra's proposal is to process up to 180 tons of contaminated soil daily; Coventry Sand & Gravel can process up to 100 tons per hour.

Legislation and Government Programs. Legislation (House Bill 9198) to formally establish the Rhode Island Geographic Information System (RI GIS) was signed into law. The bill designates the Rhode Island Division of Planning as the lead agency for management of the RI GIS, and provides technical support at the University of Rhode Island. One of the goals of the RI GIS is the development of standard map packages to support cities and towns preparing comprehensive plans. Information in the RI GIS is to include data on land use, Statewide soils, wetlands, flood plains, archeological sites, open space, and groundwater. Since individual towns in Rhode Island usually exercise control of surface mining through zoning ordinances and bylaws, the RI GIS should help local communities in their zoning decisions concerning mining activities.

The Office of the State Geologist, located at the University of Rhode Island, continued work on surficial mapping and offshore sand and gravel mapping. Also, a combined Rhode Island-Connecticut bedrock map at the scale 1:250,000 was being prepared, with possible publication by the U.S. Geological Survey (USGS). The new combined two-State map will incorporate data from the recently compiled bedrock geological map of Rhode Island that was completed at a scale of 1:100,000.

Review By Nonfuel Mineral Commodities. In October, a petition was presented to the Cumberland Town Council asking that J. H. Lynch & Sons Inc. curtail blasting at the company's crushed stone quarry within the township's boundaries. The president of the company responded by telling residents that he was willing to work out an arrangement acceptable to both sides. Lynch also said that the company hired experts to help determine the blasting level and offered to meet with residents to work out a solution.

In November, the Coventry Town Council unanimously passed an ordinance on soil erosion and sediment control primarily to further regulate sand and gravel pit operators. The ordinance was passed after residents complained about dust and noise from the town's sand and gravel pits. It requires any person or group to notify the town's building official of any plans to disturb land that may "increase the potential for soil erosion." If the town finds the possibility of significant environmental damage, a plan for controlling erosion and sediment must be submitted. The submitted plans must follow certain principles, among them: Avoiding steep slopes, respecting original boundaries, providing for adequate drainage, planting vegetation or mulch, and restoring areas damaged by construction or development. Before approval of the plan, the applicant must also file a performance bond, the amount to be determined by the Department of Public Works. The bond can be seized by the town to correct any damage caused by the applicant.

SOUTH CAROLINA

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Annual, Estimated

THE MINERAL INDUSTRY OF SOUTH CAROLINA IN 1990

Statistics compiled by the U.S. Bureau of Mines indicate that the estimate value of nonfuel mineral commodities produced in South Carolina in 1990 increased by over $58 million to $483.6 million, compared with the 1989 value. The 13.8% increase marked the eighth consecutive year that South Carolina achieved a record high.

A significant increase in the value of cement, clay, construction sand and gravel, crushed stone, gold, and vermiculite was responsible for the new record. The total value of all of the remaining non-energy minerals produced either decreased or remained essentially unchanged from 1989. The largest decline was recorded in the value of industrial sand and gravel, dimension stone, silver, and manganiferous ore.

Table 1.--Nonfuel mineral production in South Carolina 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement (portland) thousand short tons --	2,533	$118,670	2,188	$99,083	2,500	$115,000
Clays ---------- metric tons --	1,867,829	40,541	1,596,153	39,075	1,952,357	42,259
Gem stones ----------	NA	10	NA	10	NA	10
Sand and gravel:						
Construction --- thousand short tons --	7,529	20,751	e/7,500	e/23,300	7,900	25,800
Industrial ---------- do --	859	15,271	842	16,635	825	15,600
Stone:						
Crushed3/ ---------- do --	e/23,500	e/105,800	24,429	111,656	28,100	135,400
Dimension ---------- short tons --	e/353	e/31	W	W	W	W
Combined value of cement (masonry), gold, manganiferous ore, mica (scrap), peat, silver, stone (crushed shell), vermiculite, and values indicated by symbol W ----------	XX	56,728	XX	135,538	XX	149,499
Total----------	XX	357,802	XX	425,297	XX	483,648

e/Estimated. NA Not available. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Excludes certain stones; kind and value included with "Combined value" figure.

South Carolina continued to lead the Nation in the quantity and value of vermiculite produced and ranked second in kaolin production. It was also the only State east of the Mississippi River that produced gold, maintaining its ranking as the sixth leading State in the Nation. Overall, South Carolina ranked 23rd nationally in the value of all nonfuel mineral commodities produced. The State had ranked 26th the previous year.

Developments affecting the mineral industry included the start of construction on the State's fourth gold mine at Barite Hill in McCormick County. Gwalia (USA) Ltd. received a mining permit from the S.C. Division of Mining and Reclamation (DMR) in late summer and hoped to have the heap leach operation in production early in 1991. Mining operations at the Brewer Gold Co. mine in Lancaster County were suspended as a result of a dam failure caused by torrential rains. A significant fish kill in streams below the dam resulted from water containing sodium cyanide that was released by the failure. Mining operations were not expected to resume until the dam was rebuilt or a new pond was constructed.

Piedmont Mining Co. purchased the assets of MMC Holding Inc., formerly Mineral Mining Corp. Included in the purchase were mica properties near Piedmont's gold mine in Lancaster County, mining equipment, and processing facilities.

Exploration. Exploration activity in South Carolina was concentrated on the gold segment of the mineral industry. Existing producers conducted programs to increase reserves and develop new ore bodies at their current operations. Piedmont Mining Co. announced significant increases in reserves at its Haile mine.

Other companies reported to be actively exploring for gold in South Carolina included BHP Utah, a joint venture of BHP Gold Mines, Australia, and Utah International Inc.; Battle Mountain Gold Co.; and Prime Resources Corp., Canada.

Exploration for heavy minerals in ancient beach sands occurring along the Fall Line was conducted by several companies. Activity appeared to be concentrated north of South Carolina, however, and no announcements of significant discoveries in the State were released.

Environment. Plans by GCO Minerals, a Houston based subsidiary of International Paper Co., to develop a peat mine near Myrtle Beach met stiff opposition from environmentalists. At yearend, applications for permits for the operation were being reviewed by the U.S. Corps of Engineers, the State Department of Health and Environmental Control, the SC Wildlife Department, and the SC Coastal Council.

Legislation and Government Programs. Amendments to the South Carolina Mining and Reclamation Law became effective in May. Important changes included: the requirement of a certificate of exploration and a $2,500 security deposit for exploration activities under 2 acres; protection of surface water and ground water; protection of cultural and historical resources; a plan for closure of a mine; and requests for public hearings made by more than 10 people must have technical merit. The new amendments also mandated new application fees for new permits, significant modifications to existing permits, and transfer of permits. The State was also given the power to assess civil penalties and administrative costs for uncorrected violations.

The Tuscaloosa Research Center of the U.S. Bureau of Mines continued research on the effects that cyanide treated gold wastes have on the environment. Included in the studies were projects involving assessment of an abandoned tailings pond at Piedmont's Haile mine and a study of a heap leach stack during washdown at Brewer's Jefferson mine. The Bureau's Intermountain Field Operations Center in Denver completed evaluations of all three active gold mines in South Carolina.

Review by Nonfuel Mineral Commodities. **Crushed stone** was the leading mineral commodity produced in South Carolina for the second year. Over 28,000 short tons consisting primarily of granite and limestone were quarried. Other rock types produced were dolomite, marl, and shell. Its estimated value of $135.4 million accounted for 28% of the total value of nonfuel mineral produced.

Cement replaced **gold** as the second most valuable commodity produced. The quantity of **portland cement** increased 14.3% to 2.5 million short tons valued at $115 million, a rise of 16.1%. Gold was produced by three companies in Chesterfield, Fairfield, and Lancaster Counties.

Clay was the fourth most valuable mineral commodity produced. The quantity produced increased from 1.6 million metric tons in 1989 to almost 2 million tons in 1990. Correspondingly, its total value increased over 8% to $42.3 million. **Common clay and shale, fuller's earth, and kaolin** were the varieties of clay mined. South Carolina continued to be the second leading State in the production of kaolin. Other mineral commodities showing increases in both volume produced and total value included: **construction sand and gravel**, which increased 5.3% in quantity and 10.7% in value, and **vermiculite**, which increased 9.2% in both categories.

SOUTH DAKOTA

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Annual, Estimated

THE MINERAL INDUSTRY OF SOUTH DAKOTA IN 1990

The value of South Dakota's nonfuel mineral production was about $322 million in 1990, an increase of 13% compared with that of 1989, according to estimates by the U.S. Bureau of Mines. The State ranked 33rd nationally in the value of nonfuel mineral production, accounting for about 1% of the U.S. total. Gold was the leading commodity produced, followed by portland cement, construction sand and gravel, crushed stone, dimension stone, and lime. Gold accounted for 69% of the total nonfuel mineral value. Production value increased for construction sand and gravel, crushed stone, gold, gypsum, masonry cement, portland cement, and scrap mica. Nationally, South Dakota ranked third in production of gold and mica. South Dakota Governor George Mickelson signed Senate Bill 257 into law in late February. The new law imposes a mining moratorium, until January 1, 1992, that bans new large-scale surface gold and silver mining operations in the Black Hills.

Table 1.--Nonfuel mineral production in South Dakota 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry ---------- thousand short tons --	4	W	W	W	W	W
Portland ---------- do --	490	W	W	W	W	W
Gem stones ----------	NA	$100	NA	$150	NA	$150
Gold2/ ---------- kilograms --	13,981	197,026	16,123	198,318	18,108	221,230
Lead3/ ---------- metric tons --	--	--	4	3	--	--
Sand and gravel (construction)						
thousand short tons --	7,929	18,681	e/6,400	e/20,800	8,100	27,600
Silver2/ ---------- metric tons --	3	552	4	705	4	843
Stone:						
Crushed ---------- thousand short tons --	e/5,500	e/20,600	3,833	14,303	4,500	16,800
Dimension ---------- short tons --	e/43,297	e/16,472	54,623	17,738	50,688	12,871
Combined value of clays (common), feldspar, gypsum, iron ore, lime, mica (scrap), and values indicated by symbol W ----------	XX	32,288	XX	32,341	XX	42,270
Total----------	XX	285,719	XX	284,358	XX	321,564

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Recoverable content of ores, etc.

Exploration. Gold exploration efforts, outside active mining areas in the Black Hills, were significantly reduced following legislative enactment of the 2-year mining moratorium. Among those companies affected by the moratorium were Noranda Exploration Inc. and Crown Butte Resources Ltd.

They had drilled properties near Rochford. One exception, however, was the deep drilling, 5,500-plus feet, done by Homestake Mining Co. at its Sheep Tail Gulch Prospect, about 3 miles north of its Homestake Mine Ross shaft. In May, the company announced that it would spend $23 million and 5 years to extend an existing Homestake underground mine drift toward an ore grade intercept penetrated during the drilling. The area has been drilled sporadically by the company since the late 1970's.

Legislation and Government Programs. South Dakota Governor George Mickelson signed Senate Bill 257 into law, imposing a mining moratorium that will last until January 1, 1992. The act was effective immediately upon its approval, February 24, 1990, and bans new large-scale surface gold and silver mining operations in the Black Hills. The act also limits expansion of existing operations to 200 acres per operator, with mandatory concurrent reclamation beyond this limit. The moratorium bill was sponsored by the Governor but was drafted and supported by the South Dakota Mining Association. It was in response to a petition drive launched in November 1989 by a group seeking to place a surface mining initiative on the November ballot. The initiative would limit Black Hills surface gold mining to a cumulative total of 3,100 acres. Currently, as a result of the 1989 Environmental Protection Act, the State has imposed a limit of 3,500 acres until completion of the State-requested, industry-funded, cumulative environmental evaluation. The surface mining ballot initiative was defeated in the November election by a margin of 6% of the votes cast. Two previous anti-mining initiatives since 1987 had been rejected by much greater margins.

An Additional provision of Senate Bill 257 was a governor-appointed seven-member review committee, created to evaluate and make recommendations about the cumulative environmental evaluation mandated by the 1989 Centennial Environmental Protection Act. The committee will have 6 months to finish its task following completion of the evaluation, which occurred in December. The study recommended a negotiated acreage limit to mining until two mining properties have been reclaimed and the cumulative impacts of surface mining are better understood than they were in 1990. Other recommendations identified a need to improve public understanding of mining and mining regulations, to create a mineral development monitoring system, and to increase standards for reclamation and environmental quality.

The State Department of Water and Natural Resources (DWNR) received a grant of nearly $95,000 from the Western Governor's Association. The DWNR is to develop a standardized test to better determine the long-term environmental effects of surface disposal of spent gold and silver ore, previously treated with a dilute sodium cyanide solution, then neutralized using hydrogen peroxide.

Minting of collector's items, Mount Rushmore commemorative coins, was authorized by a law signed in July by President George Bush. The special coins will honor the 50th anniversary of South Dakota's Mount Rushmore National Memorial. Coins will be produced in denominations of $5, $1, and one-half dollar and will go on sale January 1, 1991. The U.S. Treasury will mint 250 million each of the $1 and 50-cent coins and 500,000 of the $5 gold piece. Surcharges on the coins could total $37.5 million, one-half of which will be earmarked for renovation and preservation of Mount Rushmore facilities. The legislation was supported by the Mount Rushmore Memorial Society and South Dakota's three congressman.

Review by Nonfuel Mineral Commodities. Estimated gold production and value each increased 12% in 1990. The increase was due to the first year of production by Golden Reward Mining Co. and general increases in production by the State's four other major operators. In June, Homestake received a conditional use permit from the Lawrence County Board of Commissioners to expand its open cut surface gold mine. This was the first step toward obtaining a mining permit from the State Board of Minerals and the Environment. The $30-million, 157-acre expansion was announced in 1989, and the company plans to begin the expansion as early as 1995.

In August, Homestake and the U.S. Environmental Protection Agency reached an agreement concerning the Whitewood Creek Superfund site. The agreement called for $1.3 million to be paid by the

company, for past EPA response measures, to fund future monitoring and to reduce health and environmental risks. Since the 1870's, Whitewood Creek was used by numerous mining companies, of which Homestake is the only one still in business, to discharge arsenic-bearing mill tailings. The company, through its subsidiary Whitewood Creek Development Corp., continued to evaluate the feasibility of mining a portion of the tailings to recover about 700,000 ounces of gold.

Wharf Resources (U.S.A.) Inc. announced it would continue drilling and environmental studies at its Foley Ridge Mine and around the old Clinton Mine, east of Foley. Company drilling showed a potential extension of ore reserves that could result in a mine expansion. The mine operations, without an expansion, and with current ore reserves, are expected to last until 1997.

Brohm Mining Corp. continued to prepare an environmental impact statement for its expansion project at the Gilt Edge Mine. The company announced plans for expansion in 1989 with intentions to begin construction by 1991 if all the necessary permits were acquired.

Bond Gold-Richmond Hill Inc. completed construction of its second and third heap leach pads. Gold production for the year was at about the same level as in 1989. In March, Lac Minerals Ltd., Bond's parent company, announced intentions to spend $75 million on Bond's international exploration effort. The Richmond Hill open pit operation was specifically singled out as one area for increased exploration.

Golden Reward Mining Co. completed its first full year of gold production. In March, MinVen Gold Corp. announced intentions to sell its one-third equity in the Golden Reward open pit-sodium cyanide heap leach mine. In July, MinVen determined, after considering various offers, that its shareholder value would be maximized by retaining, rather than selling, MinVen's interest in Golden Reward.

Portland cement production and value increased 35% and 38%, respectively. The South Dakota Cement Plant Commission studied a plan to burn flammable wastes, including motor oil and paint thinner, in its kilns, In August, plant officials signed a letter of intent with Chemical Waste Management that gives both parties 1 year to study possible effects and to work out an agreement. Earlier in the year, the plant switched from coal to natural gas for fueling its kilns.

Construction sand and gravel production and value increased 27% and 33%, respectively. **Crushed stone** production and value each increased 17%. **Dimension stone** output and value dropped 7% and 27%, respectively. In May, Field Enterprises, a quarry operator in Milbank and Bellingham, was sold to Dakota Granite Co and Rock of Ages Corp. The Field operations were renamed Whetstone Granite Co.

TENNESSEE

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Annual, Estimated

THE MINERAL INDUSTRY OF TENNESSEE IN 1990

The 1990 value of nonfuel mineral production in Tennessee increased by almost $41 million to $679.2 million, according to estimates by the U.S. Bureau of Mines. The 6.4% increase marked the fifth consecutive year that Tennessee achieved a record high. Nationally, Tennessee ranked 16th in the total value of nonfuel minerals and accounted for 2.03% of the nonfuel mineral value in the United States in 1990.

Table 1 --Nonfuel mineral production in Tennessee 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- metric tons --	1,165,736	$27,696	1,137,152	$26,292	1,192,974	$28,987
Sand and gravel (construction) thousand short tons --	6,836	23,343	e/6,100	e/21,900	5,700	21,500
Stone:						
Crushed ---------- do --	e/52,200	e/235,000	52,917	252,785	56,200	268,600
Dimension ---------- short tons --	e/3,942	e/567	4,888	437	10,108	2,051
Zinc3/ ---------- metric tons --	119,954	159,201	W	W	W	W
Combined value of barite, cement, clays (bentonite (1988), common (1989-90), fuller's earth), copper (1988-89), gem stones, lead (1988-89), lime, phosphate rock, sand and gravel (industrial), silver (1988-89), and values indicated by symbol W ----------	XX	139,842	XX	336,993	XX	358,102
Total----------	XX	585,649	XX	638,407	XX	679,240

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.
3/Recoverable content of ores, etc.

Significant increases in the total value of nine of the eleven nonfuel mineral commodities mined or produced in Tennessee were responsible for the increase. Mineral commodities that increased in value included: clays (10.2% to $29 million), crushed stone (6.3% to $269 million), dimension stone (369% to $2 million). The following commodities also increased both in quantity and value: barite, cement, gem stones, lime, phosphate rock, and zinc. The only mineral commodities that decreased in value were construction sand and gravel, which decreased 1.8% to $21.5 million, and industrial sand and gravel.

Developments affecting the mineral industry included the purchase of the Tennessee Chemical Co. (TCC) by Boliden Intertrade AG of Sweden. Approval of the

sale was delayed for over 6 months by the U.S. Bankruptcy Court, while Boliden negotiated contract changes with TCC's employees' union and reached an agreement with the U.S. Environmental Protection Agency (EPA) regarding Boliden's responsibilities for past environmental damage.

Union Zinc Co. Inc., a subsidiary of Belgium's Union Miniere SA, completed evaluation of the inactive Idol zinc mine in the Copper Ridge zinc district of east Tennessee and began operations to reopen the mine by mid-1991.

Rhone Poulenc Basic Chemicals Co., Inc. announced plans to discontinue its Tennessee phosphate rock mining operations in early 1991.

Environment. The EPA added a site in Lawrence County to its national priorities list of hazardous waste sites or Superfund site list. Studies to determine contamination levels and to formulate a corrective action plan for the site are expected to take from 18 to 24 months.

Operators of a secondary lead smelter in Memphis were fined over $350,000 by the EPA for mishandling of hazardous lead waste. Company officials claimed they were "caught in the middle" of a dispute between Tennessee regulations and EPA requirements for lead slag disposal.

Legislation and Government Programs. The only legislation affecting the minerals industry was a bill extending the period of a mining permit from 1 to 5 years and increasing the time State officials have to approve a permit from 20-30 days to 45-60 days. The Department of Energy initiated a 5-year research program to reduce by 80% the amount of uranium metal waste generated in Federal metal manufacturing installations. The Y-12 plant at Oak Ridge will be the initial site for the program.

Review by Nonfuel Mineral Commodities. **Crushed stone** has been the leading nonfuel mineral commodity produced in Tennessee since 1981. In 1990, estimated production was 56.2 million short tons, 6.2% more than the 52.9 million short tons produced in 1989. The total value of crushed stone produced represented 39.5% of the total value of nonfuel minerals produced. Major rock types quarried to produced crushed stone were limestone, dolomite, and sandstone.

Zinc remained the second leading nonfuel mineral commodity as it has every year since 1981 when it led the State in the total value of minerals produced. Zinc was mined by two companies in 1990. In east Tennessee, ASARCO Inc. operated the Young, Jefferson City Division, and Coy mines in Jefferson County and the Immel mine in Knox County. The Jersey Miniere Zinc Co. Division of Union Zinc Co. operated the Elmwood-Gordonsville mine in Smith County and the State's only zinc refinery at Clarksville, Montgomery County, both in middle Tennessee. In east Tennessee, another division of Union Zinc, the Clinch Valley Mine Co., began dewatering the inactive Idol mine in Grainger County. Resumption of zinc production was scheduled to begin by mid-1991.

Estimated **clay** production increased to 1,193 thousand metric tons from 1,137 thousand metric tons mined in 1989. The preceding figures do not include the quantity of **fuller's earth** produced, to protect proprietary company data. Types of clay included were **ball clay** and **common clay** and **shale**.

Dimension stone production increased from 4,888 metric tons in 1988 to 10,108 metric tons. Expanded operations by the Luck Stone Co. at the quarry in Blount County that it acquired from the Marble Shop Inc. in 1989 were responsible for a large part of the increase. Stone from the quarry provided the Holston marble used in the recently opened Knoxville Museum of Art.

The production of **construction sand and gravel** decreased to 5.7 million short tons in 1990 from 6.1 million tons the preceding year. It was one of only two minerals shown to decrease in the estimates for 1990. The other mineral showing a decrease was **industrial sand and gravel**.

TEXAS

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Annual, Estimated

THE MINERAL INDUSTRY OF TEXAS IN 1990

The U. S. Bureau of Mines estimated value of Texas nonfuel mineral production in 1990 was $1.6 billion. This was approximately $93 million over that reported by the industry in 1989. An enhanced demand for portland cement, construction sand and gravel, and crushed stone increased sales for the three commodities $133 million above the 1989 level. Despite the soft market for lime and some minor minerals, the strong demand for the three construction mineral commodities led to the 6.4% increase in the value estimated for the State in 1990. Mineral value, however, was $179 million below the record $1,752 billion set in 1981. Gypsum, salt, and stone were the only commodities with a higher value in 1990 than in 1981.

Table 1.--Nonfuel mineral production in Texas 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:						
Masonry ------- thousand short tons --	136	$10,800	133	$10,735	145	$11,750
Portland ------------------------ do --	7,000	292,256	7,200	286,236	8,000	320,000
Clays2/ ------------------ metric tons --	2,714,451	17,468	2,276,629	15,962	2,537,031	17,966
Gem stones ------------------------------	NA	340	NA	W	NA	W
Gypsum ---------- thousand short tons --	1,943	15,790	1,993	17,044	2,036	17,932
Lime ------------------------------ do --	1,192	55,935	1,304	60,829	1,297	60,505
Salt ------------------------------- do --	7,802	62,925	7,856	69,934	7,852	79,464
Sand and gravel:						
Construction ---------------------- do --	58,370	171,187	e/43,900	e/155,800	58,000	210,700
Industrial ------------------------ do --	1,631	28,645	1,661	29,107	1,700	29,400
Stone:						
Crushed ---------------------------- do --	e/82,000	e/271,300	76,823	252,982	82,800	285,700
Dimension ---------------- short tons --	e/66,354	e/8,310	81,268	12,449	84,500	12,600
Sulfur (Frasch) thousand metric tons --	2,622	W	2,446	W	2,240	W
Talc and pyrophyllite --- metric tons --	236,730	4,466	241,777	4,564	W	W
Combined value of clays (ball clay, kaolin), helium (crude, Grade-A) iron ore, magnesium compounds, magnesium metal, sodium sulfate (natural), and values indicated by symbol W ----------	XX	531,416	XX	546,812	XX	309,648
Total----------	XX	1,468,818	XX	1,462,454	XX	1,355,665

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.

In 1990, Texas ranked fourth nationally in total mineral output. The State's mineral value accounted for 4.65% of the Nation's total.

During the year, two Texas cement companies, one located in-State, changed hands, and work continued on the construction of a new copper smelter and modernization of an existing facility.

Environment. An environmental group expressed concern that two cement plants in Ellis County were burning "hazardous" and "toxic" waste as kiln fuel. Waste-derived products such as paint thinner, printers ink, and dry cleaning fluids and solvents account for 30-40% of the cement plant's fuel requirements. A spokesperson for the Texas Air Control Board noted that the cement kilns burned the wastes at a higher temperature and for a longer period than the State's only licensed toxic waste incinerator facility.

Alamo Cement Co., San Antonio, submitted a plan to the Texas Water Commission to dispose of recently discovered waste material from a closed cement plant. Kiln dust was discovered during construction of a new road. The cement company's plan was to excavate, transport, and spread the dust over a clay strata within the confines of the cement plant that closed in 1986. The dust would then be encapsulated with additional clay.

Legislation and Government Programs. Since the summer of 1989, the Texas Railroad Commission, the agency that regulates the State's oil industry, has issued 495 permits to drill horizontal petroleum test holes. Horizontal drilling has revived the oil industry in Texas southwest of San Antonio. In this part of the State, oil occurs in vertical to near vertical fractures and a drill hole, angled from vertical to horizontal, can intersect a number of oil-bearing features. In June, an Eagle Pass drilling firm brought in a horizontal producer with a 19,600-barrels-of-oil-per-day capability. This was the largest producer in the State in 1990.

The U.S. Army Corps of Engineers awarded a Houston firm a $10.5 million contract to cast 380,000 concrete mattress squares. Sixteen concrete squares are linked together to form a 100-square-foot mattress. Several mattresses are joined and are laid on a graded bank of the Mississippi River during low water. These act as a pavement to halt erosion and levee system damage.

Review by Nonfuel Mineral Commodities. **Portland cement, crushed stone,** and **construction sand and gravel** were the three leading mineral commodities in terms of value. The three accounted for approximately 52% of the State's estimated mineral value.

In the cement sector, Texas Industries Inc. sold its subsidiary, United Cement Co., of Artesia, MS, to Holnam Inc. Holnam was formed in March when Dundee Cement Co. and Ideal Basic Industries merged, creating the largest cement company in North America.

Pioneer Concrete of America Inc purchased a 50% interest in Beazer West Inc.'s Midlothian cement plant.

A proposed $15 million deal between Southdown Inc. and Lone Star Industries Inc. was canceled in early November. Southdown was to purchase Lone Star's Maryneal cement plant and Amarillo cement terminal. Federal Trade Commission requirements and paperwork were cited as the reason the sale plans were terminated.

Estimated crushed stone value increased almost 13% over that reported by the State's stone industry in 1989. Tonnage estimates were up almost 8%.

Sand and gravel production rose almost 65 million short tons, a 36% increase. Value increased $33 million, about 13 percent.

On the metals scene, Texas Copper Co., a Mitsubishi Metals Corp. subsidiary, continued preliminary work for a $200 million copper smelter at Texas City on Galveston Bay. The start of construction was delayed from April as the firm continued to seek the necessary environmental and engineering permits required to build the 250,000-ton-per-year smelter.

Asarco Inc.'s modernization of its El Paso copper smelter will be enhanced by the installation of a new furnace rather than retrofiting the existing unit as originally planned. The $81 million modernization project is scheduled for completion in 1991.

UTAH

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Annual, Estimated

THE MINERAL INDUSTRY OF UTAH IN 1990

According to the U.S. Bureau of Mines, the estimated 1990 total value of nonfuel mineral production in Utah was about $1.2 billion. This amount reflected a decline from the previous year of about 4% and was the first drop in value since 1985. The State fell from eighth to ninth place nationally in the output of nonfuel minerals.

Approximately 73% ($900 million) of the value of production in the State was attributed to the metals sector, including copper, gold, iron, magnesium, molybdenum, and silver. In addition, Utah mines produced significant quantities of beryllium, cement, magnesium compounds, salt, sand and gravel, and vanadium.

Table 1.--Nonfuel mineral production in Utah 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Beryllium concentrates -- metric tons --	5,308	$6	4,592	$5	5,000	$6
Cement (portland) thousand short tons --	772	39,664	W	W	1,000	58,000
Clays ---------- metric tons --	308,585	2,469	321,949	2,633	401,621	4,937
Gem stones ----------	NA	370	NA	659	NA	659
Lime ---------- thousand short tons --	365	17,252	373	17,974	326	15,710
Salt ---------- do.--	1,006	35,294	1,183	40,421	1,479	36,525
Sand and gravel:						
Construction ---------- do.--	17,843	49,796	e/14,300	e/41,500	15,400	47,000
Industrial ---------- do.--	3	60	3	60	W	W
Stone:						
Crushed ---------- do.-	e/7,300	e/20,600	4,683	19,176	4,700	20,200
Dimension ---------- short tons -	e/2,004	e/93	--	--	--	--
Combined value of cement (masonry), copper, gold, gypsum, iron ore, magnesium compounds, magnesium metal, mercury, molybdenum, phosphate rock, potash, silver, sodium sulfate (natural), vanadium, and values indicated by symbol W ----------	XX	849,243	XX	r/1,168,184	XX	1,051,632
Total----------	XX	1,014,847	XX	1,290,612	XX	1,234,669

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Environment. Late in the year, Kennecott Corp. offered a $166 million plan to reduce sulfur dioxide emissions by 67% at its copper smelter in Magna. The plan was the company's counterproposal to a plan approved by the Utah Air Conservation Committee that would require Kennecott to reduce sulfur dioxide emissions by about 81%. According to the Committee, its plan if implemented would reduce PM-10 emissions (particulate matter less than 10 microns in diameter) in the Salt Lake valley atmosphere by 15%. The company believes, however, that the smelter contributes only 2% of the total PM-10 emissions,

and it argued that the Committee plan was unscientific and unrealistic. One source of PM-10 emissions is fine, respirable sulfate particles that are found in the upper atmosphere as a result of chemical conversion of sulfur dioxide. Kennecott's plan to install a double-contact acid plant to scrub more sulfur dioxide from the smelter would reportedly increase the removal of total sulfur from 92% to 96%.

Concern continued to be expressed over a final solution to remediation projects involving mill tailings at Midvale in Salt Lake County and cement kiln dust at a site in Salt Lake City. At the Midvale site, the Environmental Protection Agency (EPA) preferred to cap the tailings with soil and vegetation and fence the area, but some members of the community wanted the tailings (14 million tons) removed. In July, the EPA issued a decision to dispose of the kiln dust (500,000 tons) in a lined landfill near Magna, but this plan was also opposed by the community. As an alternative, U.S. Pollution Control Inc., a subsidiary of Union Pacific Corp., offered to move the dust to its plant near Tooele where the material would be used to stabilize the company's caustic waste. At yearend, neither remediation issue concerning the tailings or the dust had been resolved.

Legislation and Government Programs. The State legislature in 1990 considered several bills that addressed environmental protection, taxation, and workers compensation. Senate bill 199, to increase the severance tax on all metalliferous production to 2.6% was passed into law after some modification suggested by the mining industry. Passage of Senate bill 170 adopted the Federal criminal penalties for hazardous waste violations. The Governor's proposal to create an independent department of environmental quality was reviewed by legislative leaders and recommended for further evaluation.

The Utah Supreme Court issued two decisions during the year that may have significant impact on the State's mining industry. At midyear, the Court ruled in a case involving AMAX Inc. that State-assessed property must be taxed essentially in the same manner as county-assessed property. Specifically, the Court stated that a 20% exemption allowed county-assessed properties is discriminatory. Later in the year, the Court remanded a case involving Kennecott to the Third District Court. In this case, the District Court had ruled that the State Constitution and State statutes upheld the exemption of a property's mineral estate as a taxable asset. The State Supreme Court agreed with the lower court but ruled, however, that a factual hearing must be held to determine if the actual practice of tax assessment conforms to the intent of the law or if it treats taxpayers differently and is, therefore, unconstitutional.

The Division of State Lands and Forestry placed a moratorium on the issuance of royalty agreements and surface leases for the extraction of brines and minerals from Great Salt Lake. The moratorium reportedly was enacted to provide time to determine the most beneficial way for the State to promote and regulate the development of the lake's natural resources. Current leasing practices will be examined and alternatives to leasing will be evaluated.

At yearend, the U.S. Bureau of Land Management (BLM) recommended that almost 2 million acres of land in Utah be added to the National Wilderness Preservation System. The State's congressional delegation was divided on its recommendation; one faction proposed 1.4 million acres of BLM land be designated as new wilderness and the other recommended 5.1 million acres. A report issued by the Western Economic Analysis Center asserted that restriction of the lands to wilderness use would cost the State between an average of $1.4 billion (for 1.4 million acres) and $13.2 billion (for 5.1 million acres) per year for 25 years following wilderness designation.

The U.S. Bureau of Mines continued a study begun in 1988 under the auspices of the Inventory of Land Use Restraints Program (ILURP). This long-term program was initiated by the Bureau to inventory Federal land use restrictions in order to assess accurately the availability of Federal lands for mineral entry. Under ILURP in 1990, the Bureau prepared a manuscript for the Utah study and completed mineral favorability maps for the State. Technical review of the work was made by the Utah Geological and Mineral Survey.

Review by Nonfuel Mineral Commodities. In 1990, Utah maintained its position as third in the Nation in the output of **copper**. Kennecott's Bingham Canyon Mine was the second largest producer in the Nation. In January, the company announced a $227 million project to increase copper production by

35,000 short tons per year. This expansion is expected to increase annual capacity by about 15% to 270,000 short tons compared with the current level of 235,000 short tons. The output of byproduct metals would also increase by approximately 15%. The main component of the 2-year project will be the addition of a fourth grinding line and flotation circuit at the new Copperton concentrator. In late May, Kennecott and union members ratified a 3-year agreement that provides an average wage increase of 23% over the life of the contract to more than 1,900 employees. Substantial improvements were also made in the medical plan.

Gold output by Utah mines was the fourth largest in the Nation. The Bingham Canyon Mine, producer of byproduct gold from copper ore, was the largest producer of gold in the State. The Mercur Mine in Tooele County was the largest producer of primary gold. The Mercur property, owned by American Barrick Resources Corp., was the subject of legal action filed in 1986 by Gold Standard Inc., the former owner, against Barrick and previous operators of the mine. The lawsuit alleged breach of contract and breach of fiduciary duty and sought monetary damages and the return of the property to Gold Standard. Both Kennecott's Barney's Canyon Mine (Salt Lake County) and Tenneco Minerals Inc.'s Goldstrike Mine (Washington County) produced gold as the principal commodity for a full year following startup in 1989. Potential targets for primary production that received major exploration interest during the year included the following prospects: Kings Canyon (Millard County), Long Ridge (Utah County), and Washington Dome (Washington County).

The production of **magnesium** metal in Utah was the second largest in the nation. The Magnesium Corp. of America (Magcorp) completed installation of new equipment to reduce chlorine emissions from its plant at Rowley, on the west side of the Great Salt Lake.

Portland cement output continued to rise in 1990. Plants were operated at Leamington in Millard County and at Devil's Slide in Morgan County. During the year, Ideal Basic Industries Inc., owner of the Devil's Slide property, was merged into Holnam Inc. Holnam is an indirect subsidiary of "Holderbank" Financiere Glaris Ltd. of Switzerland.

Other important commodities produced in the State were **construction sand** and **gravel, molybdenum, salt**, and **silver**. Demand for sand and gravel increased slightly during the year because of improved conditions in the construction industry. The output of molybdenum, which was produced as a byproduct of copper production at the Bingham Canyon Mine, rose substantially over that of the previous year. The increase was due chiefly to improved efficiencies realized in the molybdenum circuit at the new Copperton concentrator. Recovery of silver from stockpiled ore at the Escalante Mine ceased in 1990. Hecla Mining Co., the owner, closed the mine in 1988 because of depleted ore reserves.

Marked increases in the production of **clays** and **magnesium compounds** were reported for 1990. Most of the rise in clay production was attributed to common clays used in the rebounding construction industry. **Iron ore** production in the State remained relatively constant and **beryllium** output increased slightly. Utah ranked fourth in the nation for the production of iron ore; it was the only U.S. source of mined beryllium during the year. A new beryllium mining project adjacent to Brush Wellman Inc.'s operation in Juab County was evaluated by the principal partners, Beryllium International Corp. and Inspiration Resources. **Vanadium** was recovered as a coproduct with **uranium** in the White Mesa Mill at Blanding (San Juan County). The production of vanadium was slightly less than that of the previous year and, toward yearend, Umetco Minerals Corp. suspended operations at the mill.

Hecla put the Apex Mine in Washington County into production for **gallium** and **germanium** early in the year. Citing metallurgical and operational difficulties, however, no gallium was produced and in August the operation was halted.

A third producer, Lexco Inc., began producing **asphaltite** (uintaite) in eastern Utah during the year. The American Gilsonite Co., producer of the same commodity, was placed on sale at midyear by its parent firm, the Chevron Corp. In November, Chevron announced that it planned also to sell its fertilizer division including the **phosphate** mine near Vernal.

VERMONT

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Annual, Estimated

THE MINERAL INDUSTRY OF VERMONT IN 1990

The value of nonfuel mineral production in Vermont in 1990 was estimated by the U.S. Bureau of Mines to be $93 million. This value represents an increase of $4 million in 1990, primarily the result of higher crushed stone sales, the State's leading mineral commodity in terms of value. Other commodities produced included dimension stone, construction sand and gravel, talc, and asbestos. Nationally, the State ranked second among the 11 States that produced talc. It ranked third in quantity and second in value of dimension stone, and was one of only two States that produced asbestos.

Table 1.--Nonfuel mineral production in Vermont 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$10	NA	$10	NA	$27
Sand and gravel (construction) thousand short tons	6,017	17,478	e/6,900	e/20,400	6,100	19,000
Stone:						
Crushed do.	e/ 2/2,000	e/ 2/18,000	3,119	28,110	3,900	36,900
Dimension short tons	e/105,000	e/30,500	100,698	31,413	99,243	28,500
Combined value of other industrial minerals	XX	9,867	XX	8,969	XX	6,754
Total	XX	75,855	XX	88,902	XX	93,181

e/Estimated. NA Not available. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain stones; value included with "Combined value" figure.

Environment. Yankee Nuclear Power Corp. proposed to the State to site a low-level radioactive waste depository on land adjacent to its nuclear powerplant near the town of Vernon. Vermont Yankee produces 95% of the State's low-level radioactive waste; the rest is mainly radioactive medical waste. The company would like the State to build the waste storage facility by 1996 on a 5-acre field northwest of its plant in a 20-acre buffer zone. Company officials also contend that 40 half-buried cement bunkers would hold all the State's low-level waste for the next 40 years, including decommissioning waste from the plant's closure, now set for 2007.

Legislation and Government Programs. Two bills were passed in 1990 concerning radioactive waste. Public Act 242 relates to the scope of State regulatory control over radioactive materials. Public Act 296 creates a low-level radioactive waste authority and provides for a possible low-level radioactive waste facility. To date, Vermont has been dependent on low-level radioactive waste disposal sites in other States that are no longer required to accept waste from Vermont under provisions of the

Federal Low-Level Radioactive Waste Policy Act (FLLRWPA). The State's efforts to join an interstate compact or to sign a long-term agreement with a State or compact for the disposal of some or all of Vermont's low-level radioactive waste, have not been successful to date. The FLLRWPA also states that if a State is unable to provide for the disposal of all low-level radioactive waste generated in the State by January 1996, then, upon request of the generator, the State shall take title and possession of the waste.

Public Act 245, "An Act Relating To A Division of Geology and Mineral Resources," was signed into law in June. The Act redefines the role of the State Geologist and creates a Division of Geology and Mineral Resources within the Vermont Agency of Natural Resources.

House Bill 648, "An Act Relating To Municipal Regulation of Earth Resources, Exploration, Extraction, and Processing Operations," died in committee in May. The bill would have made it easier to establish gravel pits by allowing an Act 250 permit to be avoided if a town created its own gravel regulations.

Review By Nonfuel Mineral Commodities. Cyprus Industrial Minerals Co. announced that they would close the State's last underground **talc** mine in Hammondville by yearend. The company indicated that the mine was closing for economic and safety reasons. The 14 workers at the 40-year-old mine are expected to be shifted to company operations elsewhere. Cyprus operates talc mines in Orleans, Windham, and Windsor Counties and mills in Lamoille and Windsor Counties. In May, workers at Cyprus approved a new 4-year contract with the company. The contract was the first one negotiated with Cyprus, which purchased the assets of Vermont Talc Inc. in 1988. The workers belong to the United Cement, Lime, Gypsum, and Allied Workers Union.

In October, the Parma Corp. requested approval from the Hardwick Zoning Board of Adjustment to reopen a **granite** quarry near Mackville. Parma wants to mine monument-grade granite, 6 days per week, from the former 34-acre quarry site. If approved by the zoning board, the company would still have to obtain an Act 250 permit and other State permits before mining could begin.

VIRGINIA

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Annual, Estimated

THE MINERAL INDUSTRY OF VIRGINIA IN 1990

The value of nonfuel mineral production in Virginia in 1990 was about $512 million, according to estimated data compiled by the U.S. Bureau of Mines. Value has increased each year since 1982 and surpassed the $500 million level for the first time in 1989 and again in 1990. The sustained gain in value reflected a similar pattern of growth in the State's crushed stone industry. From 1980 through 1982, crushed stone output averaged about 37 million short tons per year. Virginia first reported crushed stone production in excess of 60 million tons in 1987 and has produced an average of 63 million tons per year since then.

Table 1.--Nonfuel mineral production in Virginia 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- metric tons --	1,010,114	$6,614	1,001,394	$6,302	781,673	$5,236
Gem stones ----------	NA	20	NA	27	NA	10
Lime ---------- thousand short tons --	741	33,875	821	38,353	858	40,077
Sand and gravel (construction) --- do.--	12,551	42,573	e/12,900	e/49,700	13,100	52,900
Stone:						
Crushed ---------- do.--	e/66,000	e/326,700	64,061	328,050	60,700	329,000
Dimension ---------- short tons --	e/10,000	e/2,900	W	W	W	W
Combined value of apilite, cement, clays (fuller's earth), gypsum, iron oxide pigments (crude), kyanite, sand and gravel (industrial), talc and pyrophyllite, vermiculite, and values indicated by symbol W ----------	XX	81,830	XX	86,698	XX	93,868
Total----------	XX	494,512	XX	509,130	XX	512,091

e/Estimated. NA Not available. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain clays; kind and value included with "Combined value" figure.

Exploration. The drilling and sampling of titanium sand mineralization continued during the year in southeastern Virginia. At least 10,000 acres were leased from landowners in parts of Dinwiddie, Sussex, and Greensville Counties by major mining companies. One of the firms, South East TiSand, a joint venture of Becker Minerals Inc. and Consolidated Rutile Ltd., completed a reclamation research project. The study, conducted on a small scale, showed that upon completion of mining, the soil remained suitable for farming.

Marline Uranium Corp. essentially ended efforts to develop a uranium mine in Virginia. Marline had discovered a deposit in the Coles Hill area containing an estimated 30 million pounds of uranium oxide (U_3O_8) ore in the early 1980's. Subsequently, uranium prices dropped from about $40 per pound to $10

per pound. In addition, local citizens groups opposed to uranium mining were successful in petitioning the General Assembly to pass legislation that banned uranium mining in Virginia. In August, Marline shut its Danville office and sold its remaining land holdings in Pittsylvania County.

Legislation and Government Programs. Enactment of Federal Clean Air legislation and construction of a major new powerplant in Virginia were expected to increase the demand for low sulfur coal produced in the State. Late in the year, a joint venture of Old Dominion Electric Cooperative, an electric power supplier, and Virginia Electric & Power Co. proposed construction of a $1.2 billion, 786-megawatt, coal-fired powerplant. The plant was designed to use a liquid scrubber emissions control system and pulverized coal-burning technology. Research by the joint venture and information provided by the Virginia Center for Coal and Energy Research resulted in the decision to use coal as the fuel source because of long-term availability and accessibility of that commodity.

Virginia produced a State record 53.3 million short tons of coal in 1990 based on projected data collected by the Energy Information Administration. Nationally, Virginia ranked seventh in coal production and has reported an increase in output each year since 1984.

Review By Nonfuel Mineral Commodities. **Crushed stone** was again the leading mineral commodity produced in Virginia accounting for about two-thirds of the State's value and output. **Cement, lime, and sand and gravel** were the other major mineral commodities produced. Output levels in 1990 were comparable to those of 1989 as demand for industrial minerals used in construction remained strong. Major changes in production were reported in cement, which showed a 25% gain in output and for clays and talc, which declined by about 20%.

WASHINGTON

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Annual, Estimated

THE MINERAL INDUSTRY OF WASHINGTON IN 1990

The estimated value of nonfuel mineral production for Washington in 1990 dropped to $473 million, a decrease of nearly 2% from 1989, according to the U.S. Bureau of Mines. Decreases in the production value of portland cement, magnesium metal, and crushed stone more than offset gains estimated for construction sand and gravel and gold. Washington ranked 24th nationally in nonfuel mineral production value in 1990, compared with 22nd in 1989.

The aggregated production value of Washington's metallic minerals--gold, magnesium metal, and silver-- dropped nearly 4% from that of 1989. Two new gold mines began production and work was begun on reopening a lead-zinc mine. Despite the closure of a cement plant, 1990 production value of industrial minerals increased slightly from that of 1989. They accounted for more than 57% of the State's total nonfuel mineral production value.

Table 1 --Nonfuel mineral production in Washington 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement (portland) thousand short tons --	979	$48,233	W	W	W	W
Clays ---------- metric tons --	376,924	2,235	233,267	$1,591	256,589	$1,877
Gem stones ----------	NA	200	NA	308	NA	208
Peat ---------- thousand short tons --	5	142	W	W	W	W
Sand and gravel (construction) --- do --	31,170	94,402	e/37,800	e/124,700	45,700	158,600
Stone:						
Crushed ---------- do --	e/13,900	e/48,700	13,259	55,624	9,500	41,900
Dimension ---------- short tons --	e/697	e/60	W	W	W	W
Combined value of calcium chloride (natural, 1988), cement (masonry), diatomite, gold, gypsum, lime, magnesium metal, olivine, sand and gravel (industrial), silver, and values indicated by symbol W ----------	XX	365,362	XX	298,756	XX	270,796
Total----------	XX	459,334	XX	480,879	XX	473,381

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Exploration. Exploration continued to be strong, especially in the northeastern part of the State. Precious metals were the primary target.

In Okanogan County, Westmont Mining Inc. drilled on its property near Manhattan Mountain. Battle Mountain Gold drilled at the Buckhorn Mountain gold project after it purchased an option to

acquire a 51% interest from Crown Resources Corp. Echo Bay Exploration continued to explore near Strawberry Lake, west of Chesaw. FMC Gold Co. conducted exploration at the Poland-China deposit.

In Stevens County, Orient Mining Co., a joint venture of Boise Cascade Minerals Corp. and Pathfinder Gold Corp., continued to explore the First Thought Mine. Others conducting exploration in the county included Battle Mountain Gold, Gold Fields Mining Corp., Newmont Exploration Ltd., and Placer Dome U.S. Inc.

In Ferry County, Echo Bay initiated a drilling project at the Lamefoot prospect. N.A. Degerstrom Inc., in a joint venture with Pegasus Gold Inc. and Inland Gold and Silver Corp., explored the Leland property.

In the Wenatchee Heights area of Chelan County, the joint venture of Asamera Minerals (U.S.) and Breakwater Resources Ltd. continued to drill at its Wenatchee Gold Project. American Copper and Nickel Co. staked a large claim block and conducted an exploration program in the Liberty area, Kittitas County.

Exploration for industrial minerals focused on lump silica, talc, and clay. United Catalyst Inc., in a joint venture with First Mississippi Gold Corp., explored for talc in Pend Oreille County. The company submitted a plan of operation to the U.S. Forest Service. Basic Resources Corp. explored for non-swelling bentonite clays at the Rock Top property in Grant County.

Environment. Del Hur Industries completed the second year of its three year, $3.1-million U.S. Forest Service contract to clean up the extensive tailings pile at the Holden Mine in Chelan County. The mine was operated by the Howe Sound Mining Co. and produced copper and some silver, gold, and zinc between 1939 and 1957. The property is now owned by a Lutheran Church retreat.

Review by Nonfuel Mineral Commodities. Northwest Alloys Inc., a wholly owned subsidiary of Aluminum Co. of America (Alcoa), produced **magnesium metal** from locally-mined dolomite at its plant in Addy, Stevens County. Reportedly, two thirds of the magnesium metal was used by Alcoa in the production of aluminum alloys, and the remainder sold on long-term contract for uses that included de-sulfurizing steel.

Asamera Minerals operated the Cannon Mine, a joint venture with Breakwater Resources, at Wenatchee; it is the largest **gold** mine in the State and the second largest underground gold mine in the Nation. A search for new reserves was conducted in the area west and northwest of the current operation.

Hecla Mining Co. operated its Republic Unit, an underground gold and **silver** mine in Ferry County. A new decline was nearing completion and a number of exploration drifts were developed. The Knob Hill No.2 shaft was used to remove ore production and also material from the areas being explored and developed. Hecla continued to aggressively explore the nearby Golden Promise area.

Echo Bay Minerals Co. began production at its Kettle River gold project in Ferry County. The project, which includes both the Kettle and Overlook underground mines, is a joint venture with Crown Resources, with Echo Bay as the operator. Near the Overlook Mine, Echo Bay constructed the 1,500-ton-per-day Key mill which contains a carbon-in pulp vat-leach system used by both mines to recover gold and silver.

The joint venture of Gold Express Inc. and N.A. Degerstrom was in the process of acquiring permits for its Gold Mountain Mine west of Danville, Ferry County. Plans for the former Gold Dike property included enlargement of the original open pit and construction of a new heap-leach pad.

Equinox Resources Ltd. began mine development and renovation of a 1,100-ton-per-day mill at its Van Stone **lead-zinc** mine in Stevens County. The company plans to be in production in 1991. Equinox purchased the mine in 1990 from Callahan Mining Co., U.S. Borax and Chemical Corp., and Brinco Ltd.; it was last operated by Asarco Inc. in 1971. Plans call for mining the deposit as an open pit for the first two years and then as an underground operation for the next five years.

Resource Finance Inc. explored the Yellowhead zone of the Pend Oreille Mine in an effort to expand lead and zinc reserves so that the property can be reopened. The company exercised an option with Gulf Resources to purchase the underground mine and has been pumping water in addition to other exploration activities.

Washington was the fourth largest producer of **construction sand and gravel** in the Nation in 1990. The bulk of the production came from the aggregate-rich, ice-margin deposits in the Puget Sound region of Clark, King, Pierce, and Snohomish Counties, and from late Wisconsin Lake Missoula flood deposits near Spokane.

La Farge Corp. closed its portland **cement** plant in Metaline Falls, citing higher than expected costs to renovate and modernize the 80-year-old facility. La Farge bought the plant and three distribution terminals from Lehigh Portland Cement Co. in 1989. In 1990, Ideal Basic Industries Inc. merged with the U.S. subsidiary of Holderbank Financiere Glaris Ltd. to become Holnam Ideal Inc. Holnam Ideal produced portland cement at its wet-process facility in Seattle. The company barged limestone to its plant site from Texada Island, British Columbia, and clay from its Twin River quarry in Clallam County. Ash Grove Cement West Inc. began building of a new state-of-the-art portland cement plant in the Puget Sound area. The facility was scheduled to begin production of Types I and II portland cement in mid-1992.

Quicklime and hydrated **lime** were produced by Continental Lime Inc. in Tacoma. Northwest Alloys produced lime as a byproduct of magnesium metal production at Addy. Witco Corp. produced **diatomite** from three pits in Grant County. The diatoms were processed and calcined at the company's two plants in Quincy.

Lane Mountain Silica Co., a division of Hemphill Brothers Inc., was the State's largest producer of **industrial sand**. The company operated a mine and plant near Addy in Stevens County. In King County, cement-grade silica was mined by L-Bar Products Inc. from the Ravensdale pit and by Ash Grove Cement from its Superior quarry.

Olivine products were produced by two companies. Olivine Corp. mined olivine from the Swen Larsen quarry in Whatcom County. The company marketed modular olivine slabs for wood and municipal waste incinerators. Applied Industrial Materials Corp. (AIMCOR) purchased olivine from Olivine Corp. and produced a crushed product for blast furnaces, refractory uses, and foundry sands at its plant near Hamilton, Skagit County.

Most of Washington's **clay** production came from King and Clallam Counties. Mutual Materials Co. was the State's largest producer. A large part of the company's production came from two pits in King County, with lesser amounts from pits in Pierce, Thurston, Cowlitz and Chelan Counties. Holnam Ideal mined the Twin River quarry west of Port Angeles, the largest clay mine in the State. Interpace Industries Inc. sold its clay pit and brick plant near Mica, Spokane County, to Mutual Materials. The plant and gas-fired kiln were modernized in 1987.

WEST VIRGINIA

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Annual, Estimated

THE MINERAL INDUSTRY OF WEST VIRGINIA IN 1990

The value of nonfuel mineral production in West Virginia in 1990 was about $132 million based on estimated data collected by the U.S. Bureau of Mines. Output of most mineral commodities was comparable to that of 1989. The largest increase in production was reported for sand and gravel at 22%; the biggest drop in output was for clays at 28%.

In fuels, coal production increased for the fifth year in a row and West Virginia ranked third nationally in output. About 153 million short tons of coal was produced in the State in 1990, according to the Energy Information Administration.

Table 1.--Nonfuel mineral production in West Virginia 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- metric tons --	239,473	$586	251,385	$553	181,577	$480
Gem stones ----------	NA	1	NA	1	NA	1
Peat ---------- thousand short tons --	W	W	W	W	3/	20
Sand and gravel (construction) --- do --	1,653	6,099	e/2,300	e/8,700	2,800	8,570
Stone (crushed) ---------- do --	e/11,600	e/47,600	2/10,904	2/42,538	11,700	45,200
Combined value of cement, lime, salt, salt, sand and gravel (industrial), stone [crushed granite, (1989-90)], and values indicated by symbol W ------	XX	73,169	XX	75,706	XX	77,737
Total----------	XX	127,455	XX	125,498	XX	132,008

e/Estimated. NA Not available. XX Not applicable.
1/Production as measured by mine shipments, or marketable production (including consumption by producers).
2/Excludes certain stones; kind and value included with "Combined value" data.
3/Less than 1/2 unit.

Legislation and Government Programs. The West Virginia Legislature, concerned about the State's education programs, enacted measures to generate $65 million in tax revenue. Included in the tax package was an increase of 50 cents per ton in the severance tax on coal.

The West Virginia Geological and Economic Survey, in cooperation with the U.S. Geological Survey, began a study on manganese in the counties of Mercer, Monroe, Greenbrier, and Pocahontas in southeastern West Virginia. Ore sampling and mapping of the area were started late in the year. A final report on the study was scheduled for completion in the fall of 1991. The United States imports 100% of the manganese it uses, primarily from the Republic of South Africa, Gabon, and France.

In November, the U.S. Bureau of Mines awarded West Virginia State College a $50,000 grant to conduct research in human resource development in underground coal mines. The study was expected to

provide information on how miners use technology in emergency situations. The work was scheduled for completion in December of 1991.

Review By Nonfuel Mineral Commodities. **Crushed stone** was again the leading nonfuel mineral commodity produced in West Virginia, accounting for about one-third of the State's value. Early in 1990, the State's top stone producer, Millville Quarry Inc., sold its Jefferson County limestone operation to Evered PLC of the United Kingdom. Most of the crushed stone produced at the Millville quarry was sold in the Baltimore, MD, and Washington, DC, markets for use in construction.

Because of the continuing growth and development in the Baltimore and Washington areas, Brigham & Day Co. proposed developing a quarry on a 310-acre site in Kearneysville. In 1990, Brigham & Day submitted a permit application to the West Virginia Division of Energy and requested rezoning from local government. Both matters were pending at yearend.

In December, Wheeling-Nisshin Inc. announced plans to construct a 240,000-short-ton-per-year steel galvanizing operation. The new continuous coating line was expected to cost $120 million and increase Wheeling-Nisshin's capacity at the Follansbee site to 510,000 tons annually. The project was scheduled for completion in 1993 and required approval by U.S. Bankruptcy Court. Wheeling-Pittsburgh Steel Corp., a joint venture partner with Nisshin Steel Co. Ltd. of Japan in the project, has been in Chapter 11 bankruptcy protection since 1985.

WISCONSIN

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Annual, Estimated

THE MINERAL INDUSTRY OF WISCONSIN IN 1990

The estimated value of Wisconsin's nonfuel mineral production was $210 million, according to the U.S. Bureau of Mines. This was an increase of 13% compared with that of 1989. The State ranked 38th, nationally, in the value of nonfuel mineral production. Production and value increased for lime, peat, construction sand and gravel, and crushed stone. Production was estimated to have decreased for industrial sand and dimension stone. In terms of value, crushed stone was Wisconsin's leading mineral commodity, followed by construction sand and gravel, industrial sand, lime, dimension stone, and peat.

Table 1.--Nonfuel mineral production in Wisconsin 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$15	NA	W	NA	W
Lime ---------- thousand short tons --	452	23,986	437	$18,129	452	$18,753
Peat ---------- do.--	11	270	13	309	25	688
Sand and gravel:						
Construction ---------- do.--	25,048	60,080	e/21,700	e/56,400	28,000	76,400
Industrial ---------- do.--	1,351	15,458	1,514	22,399	1,450	18,900
Stone:						
Crushed ---------- do.--	e/ 2/28,500	e/ 2/98,300	26,520	83,664	27,500	91,000
Dimension ---------- short tons --	e/49,900	e/6,200	35,587	4,376	31,316	3,811
Combined value of other industrial minerals and values indicated by symbol W	XX	564	XX	(3/)	XX	(3/)
Total	XX	204,873	XX	4/185,277	XX	4/209,552

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.
1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/Excludes certain stones; value included with "Combined value" figure.
3/Value excluded to avoid disclosing company proprietary data.
4/Partial total, excludes values that must be concealed to avoid disclosing company proprietary data.

Exploration. In November, Noranda Exploration Inc. released results of drilling at its Lynne project in Oneida County. Results indicated a massive sulfide deposit with metal grades as high as 28% zinc, 4% copper, 4.27% lead, 5.49 ounces gold per ton, and 0.053 ounce silver per ton. Mineralization occurred at depths ranging from 72 feet to 832 feet. A decision by Noranda on whether to file with the Department of Natural Resources a Notification of Intent to collect environmental baseline data will be made in early 1991. The initial target was discovered through a ground electromagnetic and magnetic geophysical survey that indicated an anomalous zone with a discontinuous strike length of 1,200 feet.

Drilling elsewhere in Wisconsin for massive sulfide and precious metals deposits also was done by Ernest K. Lehmann & Associates of Minneapolis and Placer Dome U.S. Inc. Lehmann explored the Bend

deposit in Westboro Township in the Chequamegon National Forest in Taylor County. Placer explored in Enterprise Township in Oneida County under a sublease agreement with Pelangio-Larder Mines, Great Lakes Exploration, and Quote Resources. The leases had been acquired in 1989.

International Inc. received a 10-year lease from Marinette County Board of Supervisors to explore and prospect for minerals on about 15,500 acres. In September, the Price County Forestry Committee recommended that the county take bids for exploration leases following inquiries by several mining companies. Companies known to be interested were Noranda, Lehmann & Associates, and BHP-Utah. Interest was focused on 280 acres in the Chequamegon National Forest in Emery Township on which Price County owns the mineral rights.

Legislation and Government Programs. Two bills that would have prohibited mining on State lands under the jurisdiction of the Department of Natural Resources died in committee. The proposed legislation, introduced in late 1989, was in response to mining company interest in exploring State wildlife land.

The Wisconsin Public Lands Commission granted Ernest K. Lehmann & Associates and Chevron Resources Inc. a joint venture mining lease for 160 acres in Oneida County near Rhinelander. This was the first time a Wisconsin State agency had leased State-owned land. The companies indicated they would explore for base and precious metals. Under provisions of the lease, Lehmann and Chevron have rights to explore and mine the area for up to 50 years. In return, the State will receive a fee of $5 per acre the first year, escalating to $20 per acre after 10 years, during the exploration phase, and royalties based on percentages of net smelter returns and net profits if mining takes place.

Review by Nonfuel Mineral Commodities. **Crushed stone** was the State's leading nonfuel mineral commodity. In 1990, production and value were estimated to have increased 4% and 9%, respectively. **Construction sand and gravel** increased 29% in production and 35% in value. **Industrial sand** output slipped 4% to 1.4 million short tons, valued at $18.9 million, down 16%. **Lime** production and value each were down about 3%. **Dimension stone** again declined, falling about 12% in output and 13% in value. **Peat** sales were up 92%, and value increased 123%.

Flambeau Mining Co. awaited a decision by an administrative law judge concerning a mining permit for its **copper-silver-gold** deposit near Ladysmith. In March, the final environmental impact statement was released for the proposed mine in Rusk County. In July, public hearings were held by the judge, and a decision is expected in early 1991. The Proterozoic volcanic and volcaniclastic massive-sulfide 32-acre deposit has nearly 1.9 million short tons of ore, grading 10% copper, 0.50 troy ounce of silver per ton, and 0.05 troy ounce of gold per ton. The open-pit mine project would employ about 60 people, have a life of about 6 years, and cost about $286 million, including $9.5 million for reclamation. The pit would be about 550 feet wide, 2,600 feet long, and 225 feet deep. Ore would be produced at a daily rate of 1,300 tons, crushed to a minus 12-inch diameter, and railed to a yet-to-be-determined out-of-State processing facility.

In December, E.K. Lehmann & Associates and Wisconsin Mineral Resources Inc. announced intentions to apply for permits to mine the Bend copper and gold deposit in Taylor County. The 80-acre site in Westboro Township is in the Chequamegon National Forest. Taylor County owns the mineral rights. The 10-year project would cost $75 million and employ 125 people. Underground mining methods would be used to mine the 3-million-short-ton deposit. Ore processing would be by commonly-used cyanide vat leaching methods. The deposit was valued at $234 million, given copper prices of about $1 per pound and gold at $350 per ounce.

WYOMING

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Annual, Estimated

THE MINERAL INDUSTRY OF WYOMING IN 1990

According to the U.S. Bureau of Mines, the estimated value of nonfuel mineral production for Wyoming in 1990 was $934 million, an increase of almost 13% from 1989. Gains in the production values of natural sodium carbonate (soda ash) and clays were largely responsible for the increase. Wyoming ranked 13th nationally in the value of nonfuel mineral production, all in industrial minerals.

Wyoming led the Nation both in soda ash and bentonite clay production. The State was ranked second of four States that produced Grade-A helium. The 1990 production value of soda ash, the State's highest valued mineral commodity, increased nearly 14% over 1989. During the year, all of Wyoming's soda ash producers operated at near capacity and had expanded, were in the process of expanding and modernizing, or had announced expansion and renovation plans for their production facilities. Three commodities--soda ash, Grade-A helium, and clays--accounted for about 95% of the State's nonfuel mineral production. No metal production was reported.

Table 1.--Nonfuel mineral production in Wyoming 1/

Mineral	1988		1989		1990e/	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays2/ ---------- metric tons --	2,138,796	$72,174	2,166,497	$74,697	2,274,820	$82,348
Gem stones ----------	NA	150	NA	157	NA	157
Lime ---------- thousand short tons --	26	1,640	W	W	W	W
Sand and gravel (construction) --- do --	3,413	11,351	e/4,500	e/15,400	5,000	17,900
Stone (crushed) ---------- do.--	e/2,500	e/11,400	2,990	12,120	3,300	14,000
Combined value of cement (masonry (1988-89), portland), clays (common), gypsum, helium (Grade-A), soda ash, and values indicated by symbol W ----------	XX	613,097	XX	724,987	XX	819,933
Total----------	XX	709,812	XX	827,361	XX	934,338

e/Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined value" figure. XX Not applicable.

1/Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

2/Excludes certain clays; kind and value included with "Combined value" figure.

Exploration. Areas of exploration reported throughout the State included the Keystone district of the Medicine Bow Mountains, the Rattlesnake Hills of the Granite Mountains, the South Pass region of the Wind River Range, and the Sunlight district of the Absaroka Mountains.

The joint venture of Goldstake Explorations Inc. and Sawatch Gold Placers Inc. began a major drilling program on their South Pass gold property, adjacent to the Atlantic City gold district, south of Lander. CoCa Mines Inc. drilled on its Sundance gold project in Crook County. American Mining and

Milling Co. worked on permitting and lease agreements necessary to mine gold and silver near Clark's Fork River, near Clark, Park County. Medicine Bow Minerals Co. received approval to begin gold exploration in the French Creek area of the Medicine Bow National Forest.

The Wyoming Board of Land Commissioners issued a controversial temporary use permit to Pete Lien and Sons to use a road east of Laramie to survey a limestone quarry. An Albany County judge upheld Lien's right of access for surveying and site evaluation. The company was expected to prepare an environmental impact statement since the property is on Bureau of Land Management (BLM) land.

BWAB Inc. sought permission from the BLM to explore, test, and possibly develop trona resources near Eden, Sweetwater County. The Denver-based energy company proposed the drilling of exploratory wells in an attempt to locate black trona water (sodium) and determine its economic viability.

The Geological Survey of Wyoming (GSW) completed a preliminary reconnaissance map of the Seminoe Mountains, northeast of Rawlins, and reported that their studies indicate significant gold and zinc mineralization in certain portions of the area. GSW also sampled the central Laramie Range in search of diamonds; the project was expanded into the Medicine Bow Mountains in the vicinity of Mullison Park.

Environment. A mineral examiner for the U.S. Forest Service determined that a deposit of quartzite in the Snowy Range cannot be extracted under the Mining Law of 1872. The quartzite was not considered unique enough to be defined as a locatable mineral under the established guidelines. Medicine Bow National Forest managers had recommended that 21,000 acres of land in the Snowy Range area, including the proposed quartzite quarry near Browns Peak, be withdrawn from mineral activity.

Legislation and Government Programs. The Wyoming Legislature passed four House Bills regarding the valuation of coal, uranium, bentonite clay, sand and gravel, and other solid minerals. In the past, the minerals industry had been confronted with unexpected tax changes that affected profits and discouraged a willingness to invest in the State. The new valuations package was expected to provide the minerals industry and the State with a fair and predictable mineral tax system.

A lawsuit was filed challenging the Wyoming Department of Environmental Quality's authority to issue a permit for a proposed limestone quarry on Bessemer Mountain near Casper. The permit was issued to Rissler & McMurry Co. and later upheld in court under the 10-acre exemption rule, a rule which allows work at mining properties of 10 acres or less to commence without extensive environmental review. Opponents contended that the proposed quarry operation would ultimately exceed ten acres after a new road, storage, parking spaces, scales and other ancillary facilities were constructed. Limestone from the quarry would be used as aggregate for highway and other construction projects.

Review by Nonfuel Mineral Commodities. At Green River in Sweetwater County, FMC Wyoming Corp. operated the world's largest **soda ash** complex, including the State's oldest trona-producing mine. The recently modernized underground mine was the only noncoal longwall operation in the Nation, and the only trona mine in the Green River Basin not using a mobile continuous conveyor to carry ore out of the mine. In 1990, the company's new liquid sodium cyanide plant was dedicated, along with a new caustic soda and bicarbonate plant, also under construction.

General Chemical Co., the State's second largest soda ash producer, continued to modernize and de-bottleneck parts of its Green River operation. The company asked the State for permission to expand its nameplate capacity. Rhone-Poulenc of Wyoming Co., a joint venture of Rhone-Poulenc Basic Chemicals Co., and Union Pacific Resources Co., also began expansion of its soda ash plant. The French-based company purchased the former Stauffer Chemical Co. facilities in 1988.

Tg Soda Ash Inc. planned to build a new caustic soda plant at its soda ash facility northwest of Green River. Waste water from the company's mine would be used as feedstock for the plant. The plant is a joint venture of Tg Soda Ash and Atochem North American Inc., both subsidiaries of Elf Aquitaine Inc., a French company.

Tenneco Minerals Co. announced approval by the Wyoming Industrial Siting Council of a two-stage plant expansion that could possibly make the Tenneco operation the second largest soda ash producer in the Nation. In a joint venture with Asahi Glass Co., Japan's largest glass producer, Tenneco also was constructing a plant to produce caustic soda and sodium sulfite.

Wyoming was by far the Nation's leading producer of bentonite **clay.** Although oil and gas drilling, a major user of bentonite, was sluggish in 1990, Wyoming bentonite plants remained open. Bentonite was produced by American Colloid Co., Baroid Drilling Fluids Inc., Kaycee Bentonite Partnership, M-1 Drilling Fluids Co. and Wyo-Ben Inc.

Meridian Minerals Co. produced **crushed stone** for railroad ballast from a quarry and processing plant at Granite, west of Cheyenne in Laramie County. Reportedly, the property was up for sale by Meridian. A new company, Sunrise Stone Co., began studying the feasibility of producing **dimension stone** in Wyoming. The Geological Survey of Wyoming prepared ove: seventy cut and polished samples of dimension stone and made them available for public inspection.

Mountain Cement Co., a joint venture of Lone Star Industries and Centex Corp., operated Wyoming's only **cement** plant at or near capacity; the plant is sited south of Laramie, Albany County.

Gypsum was produced near Cody and at Himes, between Lovel and Greybull, both in the Bighorn Basin. Both facilities operated at near capacity levels. Mountain Cement mined gypsum near Laramie for use at its cement plant south of the city.

Limestone was quarried in several areas of the State for use as construction aggregate or in the manufacture of cement. Divide Construction Co. quarried limestone from the Bass Quarry north of Hartville to be used in the cleanup of power plant emissions.

Rocky Mountain Zeolites Inc. was developing a **zeolite** deposit near old Fort LaClede, in the Washakie Basin in Sweetwater County. The company was planning to market natural clinoptilolite, a product used in the cleanup of various types of environmental waste.

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally-owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.

U. S. DEPARTMENT OF THE INTERIOR

BUREAU OF MINES